SPECIAL REPORT: Inside Taiwan, today's tool-making giant

Better Homes and Gardens®

WOOD®

THE WORLD'S LEADING WOODWORKING MAGAZINE
OCTOBER 1997 ISSUE NO. 99
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MIDSIZED PLUNGE ROUTERS

See which ones measure up

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BIG PROJECTS

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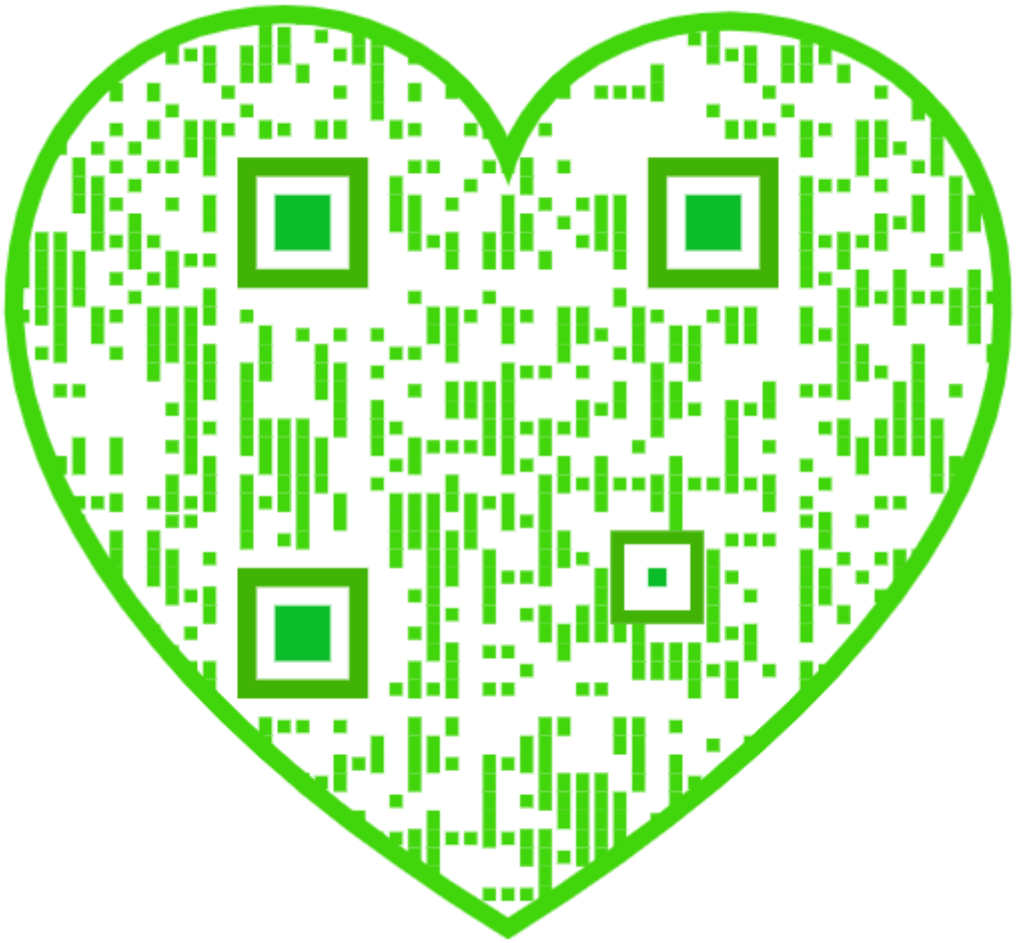

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This issue's cover wood grain: pitch pine

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•While you're at *WOOD ONLINE*, don't forget to stop by the registration page and sign up for a chance to win a great tool prize.

THE EDITOR'S ANGLE

AND THEN THERE WERE PENGUINS!

Not having been blessed with much artistic ability myself, I've always been fascinated by the talents of people who can design things well. They make it appear so easy to do.

In my travels for *WOOD®* magazine over the years, I've encountered quite a few talented project designers, and the staff and I have brought many of their creations to you on these pages. One of the most gifted individuals, George Hans, I met by accident.

I was exiting the freeway on my way to work one morning, and I spied a pair of George's now-famous reindeer in the window of an antique store. I was taken immediately by their beauty, so I hurried to work and brought Jim Downing, *WOOD* magazine's design editor, to the store for a look. Jim was impressed, too, so he contacted George, a retired art teacher, and made arrangements to purchase the publication rights.

Shortly after that, we ran plans for the foyer- and tabletop-sized reindeers in the magazine and prepared plans for the full-sized ones. The designs proved overwhelmingly popular with you, our readers. The results have been legendary. Before and during the holidays, these woodland creatures seemingly are everywhere. You've no doubt seen them in your area of the country, too.

Now, after a hiatus of several years, we can all look forward to seeing more of George's refreshing designs in future issues of this magazine. I can't wait!

Marlen Kemmet, *WOOD* magazine's How-To Editor/ WOOD PLANS® coordinator (left), and George Hans admire George's latest creations.

Note in the photograph *above* that George's reindeer now has three penguin pals to hang out with. As you can see, these little guys have some of the same graceful lines that made their predecessors such a hit.

You'll find scaled-down plans for the penguins in an upcoming issue of the magazine. But if you want to make the full-sized versions and get them out in your front yard in time for the holidays, please call 1-800-572-9350 to find out how to order a set of plans.

A big thanks to George and to all of the other talented people who continue to share the results of their creative labor with me and the entire *WOOD* magazine family. We appreciate it.

Larry Clayton

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TALKING BACK

Mechanical reinforcement tip

In the article "Secrets to Clamping Success" in the January 1997 issue, you suggest using mechanical reinforcements in edge-glued joints. Can you give me some guidelines on this?

—David Fudge, Palm Beach, Fla.

Dowel pins, splines, and biscuits all reinforce edge-glued joints, David. But, we prefer splines and biscuits, especially when aligning boards that vary in thickness and have some warp.

Edge-joining with either intermittent splines or biscuits ensures that the face surfaces align flush during assembly and clamping. Further, using intermittent splines or biscuits makes it possible to dry-clamp before assembly. The intermittent spline technique, as shown below, *also eliminates the need for a biscuit joiner. Instead, you can use a slot cutting bit in your router.*

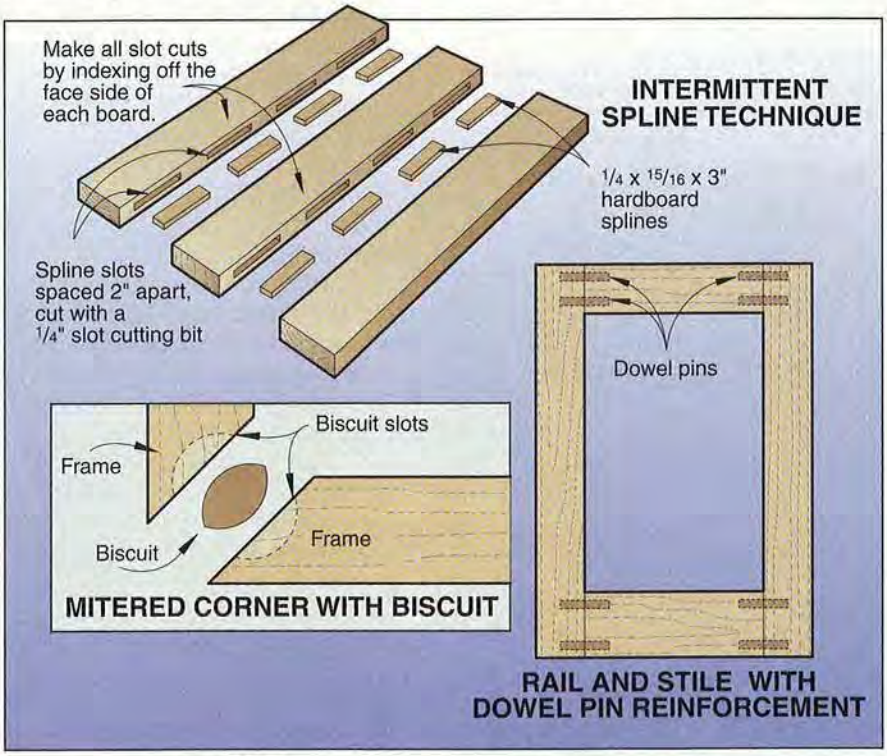
To use a router-mounted slot cutting bit, index the cutter from the face side of the workpieces. A hand-held router will follow any bowing in the board, making alignment possible.

Mechanical reinforcements become most important in end-grain to end-grain, or end-grain to edge-grain joints. Using reinforcements in these joints both increases the glue area and allows for some "with the grain" orientation. We prefer to use biscuits or splines where possible, such as the mitered corner below. *But, for workpieces too narrow to accept a biscuit or spline, such as in the rail and stile frame shown* below, *dowel pins work well.*

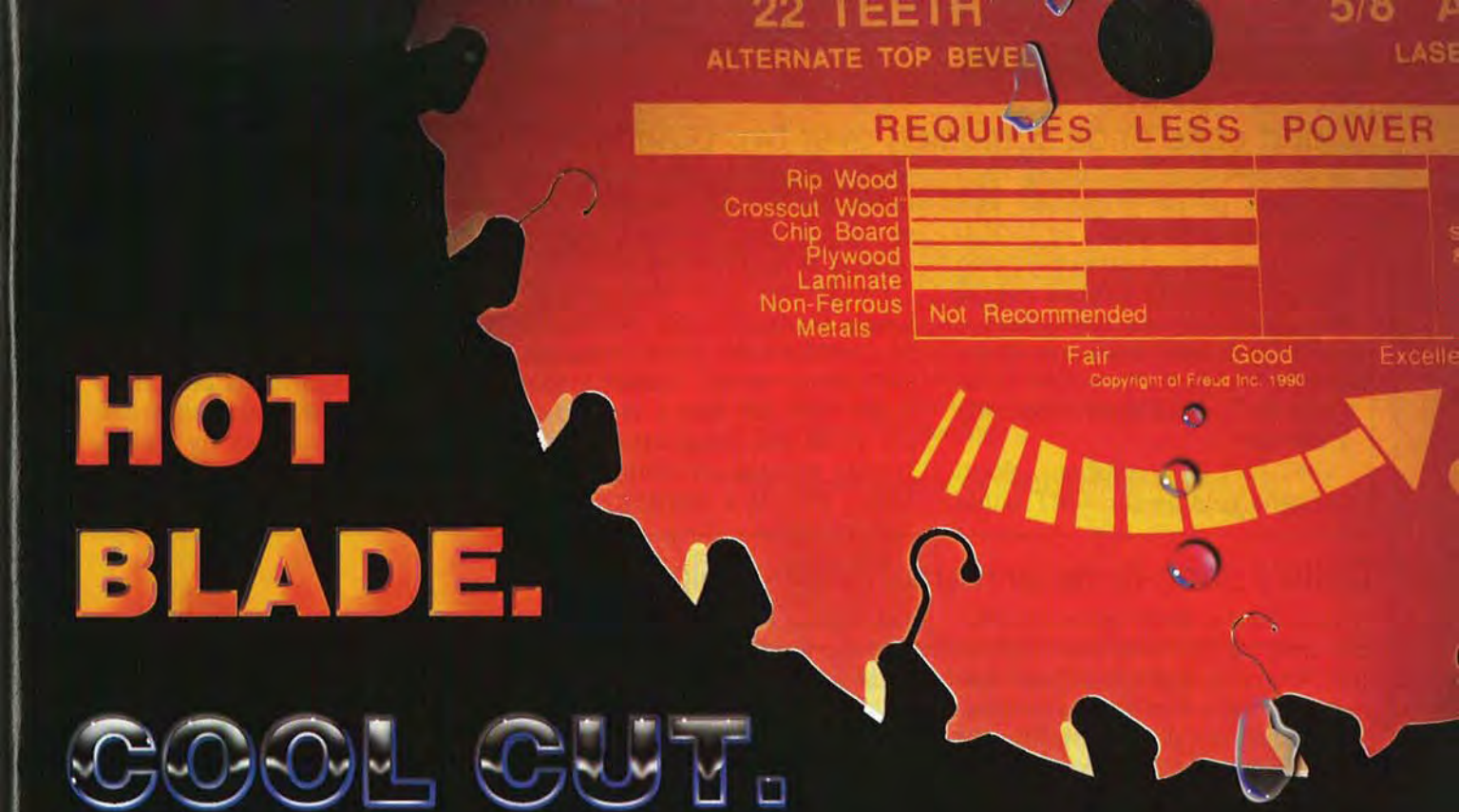
How to reach us

We welcome comments, criticisms, suggestions, and even compliments. We'll do our best to respond, perhaps even on this page! You can "talk back":

- ***Via mail.*** Send your letter to Talking Back, *WOOD®* Magazine, 1912 Grand Ave., Des Moines, IA 50309-3379.
- ***Via computer.*** Send e-mail to: **woodmail@woodmagazine.com**


Make all slot cuts by indexing off the face side of each board.
INTERMITTENT SPLINE TECHNIQUE
1/4 x 15/16 x 3" hardboard splines
Spline slots spaced 2" apart, cut with a 1/4" slot cutting bit
Dowel pins
Biscuit slots
Frame
Biscuit
Frame
MITERED CORNER WITH BISCUIT
RAIL AND STILE WITH DOWEL PIN REINFORCEMENT

Continued on page 6



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• This puts less stress on the blade. Studies by DuPont tell us that TCS coated blades last up to 50% longer than conventional blades before sharpening.

• It also causes less pull on the saw, 38% to be exact. Which translates into over 1/3 more cutting power. And as a bonus, the smoother cutting action means less wear and tear on the motor.

• TCS blades won't bind like conventional blades. The self-lubricating, non-stick finish sheds sappy wood residue before it builds up. So you will get a smoother, more professional cut with TCS blades.

• Clean up with these blades is also easy. Pitch and resins just don't stick well to the industrial Teflon. So, even after extensive use, simply wipe clean with hot water.

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Continued from page 4

Court case ends confusion over two brands of CMT router bits

As discussed in the Talking Back sections in the October and November 1996 issues of *WOOD* magazine, the existence of two different lines of orange router bits—both with the CMT name—has created some confusion in the woodworking marketplace. Now, a jury has handed down a decision in the case.

CMT USA of Greensboro, North Carolina retains the CMT name and orange color for its Italian-made bits. For the CMT USA dealer nearest you, call the company toll-free at 888/268-2487.

The former CMT Tools is now Jesada Tools. The jury awarded it $1.7 million for promoting the CMT name in the United States (CMT USA has filed a motion to set aside the monetary award.) Jesada retains its orange fruit logo. Jesada's owner, Carlo Venditto, assures us that Jesada bits will be unchanged from the bits he manufactured before except for a new white coating. (Look for a performance test of Jesada bits in a future issue.) Meanwhile, you can request a Jesada catalog or order bits directly from the Oldsmar, Florida-based manufacturer by calling 800/531-5559.

—Bill Krier, Assistant Managing Editor

Delta's soon-to-be-universal tenoning jig

I purchased a Delta model 34-182 tenoning jig that was reviewed in the December 1996 issue, and I'm having trouble setting it up on my Sears tablesaw. When I put the jig in the left-hand miter slot of my saw, with the vertical fence of the jig against the saw blade, the jig's measuring scale should read zero, but it doesn't.

Do different brands of tablesaws have different measurements between the miter gauge slots and the blade? And, how can I adjust the jig to use it on my tablesaw?

—Paul Foster, Chatham, Ont.

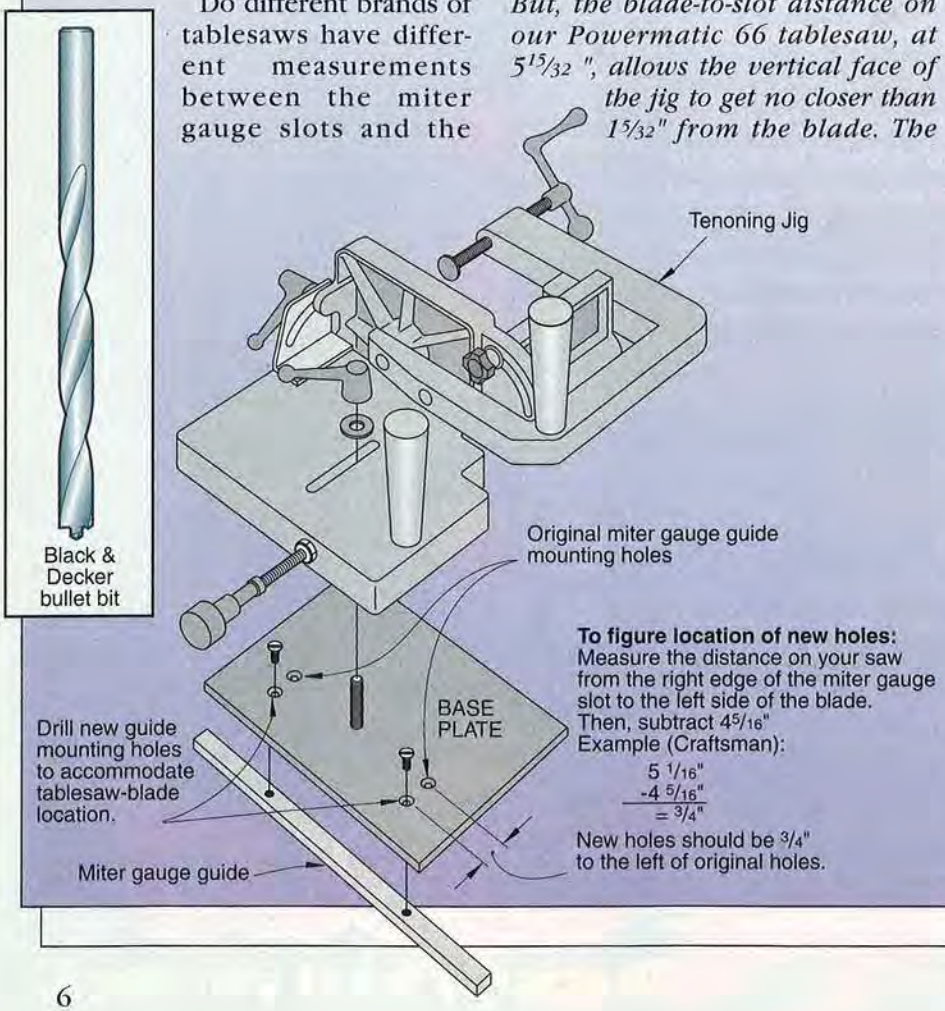
Paul, no industry standard exists for the distance between a tablesaw miter-gauge slot and the saw blade. For example, in our shop, the Delta jig zeroes out perfectly on the Delta Unisaw, with a distance of 4 5/16". But, the blade-to-slot distance on our Powermatic 66 tablesaw, at 5 15/32", allows the vertical face of the jig to get no closer than 1 5/32" from the blade. The problem also occurs with the newer Craftsman models, with a blade-to-slot distance of 5 1/16".

Because of these variations, you will have a problem not only with zeroing the scale, but also with getting close enough to the blade to make the necessary cuts.

However, there are solutions to both of these problems. First, you can replace and reposition the measuring rule on the jig. To get a replacement rule for $1.75, call Delta at 800/223-7278 and ask for part #1345964.

If you can't get the vertical face close enough to the blade to make the necessary cut, you will need to drill new holes in the jig's baseplate (see illustration left*) to reposition the miter gauge guide. Because the new holes must be parallel with the original bolt holes, use a drill press at a low rpm and a Black & Decker Bullet bit to drill the holes. The pilot point of the Bullet bit reduces wandering when boring into metal or cast iron.*

Delta is now looking at ways to make its jig more universal. Some of the possible options include drilling a series of holes into the base plate to allow you to reposition the miter gauge guide without drilling new holes. Also, Delta may stop applying the measuring scale at the factory, allowing you to apply it yourself.


Black & Decker bullet bit
Tenoning Jig
Original miter gauge guide mounting holes
BASE PLATE
Drill new guide mounting holes to accommodate tablesaw-blade location.
Miter gauge guide
To figure location of new holes:
Measure the distance on your saw from the right edge of the miter gauge slot to the left side of the blade.
Then, subtract 4 5/16"
Example (Craftsman):
5 1/16"
-4 5/16"
= 3/4"
New holes should be 3/4" to the left of original holes.

Best Saw....Best Buy

The 66 TA Saw...An American Legend

"Most powerful saw we tested; built like a battleship, virtually vibration-free..."
"The Powermatic was unstoppable in our cutting test..."

"A peek under the hood reveals that Powermatic's trunnions, arbor and motor mount assembly are heavier than those on other saws..."

"Powermatic gets our Editors' Choice award as best cabinet saw of the bunch."
American Woodworker, Dec. 1995

REGARDING ARBOR ASSEMBLIES...
"All in all, the Powermatic impressed us more than the other saws in this area. One reason it has almost no runout is its thick, accurately machined inner and outer blade flanges. And, the Powermatic is the only machine with a 3/4"- diameter arbor shaft (milled to 5/8" at the threaded end to accept blades with 5/8" bores). The other machines have 5/8" arbors supported by 5/8" bearings..."

"The biggest, baddest, best-made machine in this test."
WOOD®, Aug. 1997

The above quotes from two of the most respected woodworking magazines in the country clearly demonstrate the superiority of the Powermatic 66 Table Saw when comparisons are made with any other table saw in its class. No mention was made of the left tilt saw blade that Powermatic developed and has used for over forty years, (and is only now being introduced by the other guys as one of their main features). Certainly, the left tilt saw blade makes cleaner cuts and is safer, but the experts who conduct comparative saw tests realize that performance comes from the *inner* structure of a saw. This is where the 66 is way ahead of the pack because the basic requirement of any table saw is its ability to hold the blade accurately in position during the cutting operation.

In support of this, the 66 weighs an average 189 lbs. more than the competition. Most of that poundage can be found in the Powermatic trunnion. This one-piece, heavy cast iron body delivers rock-solid, vibration-free performance. And don't be fooled by the competition saying they use three belts to drive their machines and Powermatic uses only two-a fact we readily admit. Do you know why we only use two belts? Because the two 3VX belts we use are a much *higher* grade than the competitions, transmit more horse-power, and run much cooler which in turn is easier on the arbor and bearings. Team up the 66 with the all new ACCU-FENCE® by Powermatic, and you have the best saw system in America!

Enough said? Not by a long shot! Go to your local dealer and get all the facts on the 66 Table Saw, and while you're there, get in on the great savings, including a $200.00 savings bond, offered by Powermatic.

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WOW!

And the 1996 winners are...

Toy contest judges (from left) Jan Hale Svec, Major David Pere, USMC, and Jim Downing had almost as much fun looking over all the entries as readers did building them.

With all the wonderful entries you *WOOD*® magazine readers entered in our 1996 Build-A-Toy® contest, it's a wonder that the judges ever managed to pick winners. See the photos on these pages and try to imagine what they went through!

There were trucks (as always), tractors (you bet), airplanes, riding toys, rocking horses, puzzles, doll toys, pull toys (some great ones), scaled-down woodworking machines (nifty), some remarkable models, and you name it. Unfortunately, every entry couldn't claim a prize, but every one of them did help make a child

Frank Ryan's maple, 16-piece "Imagine-A-Toy" won Best Toy Entry. With it, a child could build at least a dozen toys.

Home hobbyist Larry Weaver entered a magnificently crafted tractor and disc that captured Grand Prize in his division.

Jack Dalton won First Prize in Home Hobbyist with his 30"-long 1934 Chevy pickup.

The brightly painted fire truck by home hobbyist Bob Schnare earned him Second Prize.

WHAT GREAT TOYS!

happy at Christmas. That's because at the Crafted for Joy toy auction last November, the entries raised enough cash to buy nearly $20,000 in new toys for donation to the U.S. Marine Corps Reserve's Toys for Tots drive. (See the list of top auction money raisers on *page 82*.)

Of course, there were some readers who had entered before—like pros Mike Jagielo, Neil Seely, and Dee Cook, plus home hobbyists Larry Weaver, Jack Dalton, and George Cole—and chalked up more wins this year. But it was first-time entrant Frank Ryan, of Eugene, Oregon, who captured the contest's top prize with his creative and finely crafted "Imagine-A-Toy" as shown, *far left, opposite page.*

The budding woodworkers in the Junior Craftsman division (new for 1996) did a great job, too. Just look at Kentuckian Elton Eby's heavy-duty, working crane shown in the photo *below right.* And then there was that woodshop class from Mechanicsburg, Pennsylvania's Intermediate School—their little trains indicated fine young talent at work.

In case you're curious about how the judges selected winners (see the complete list on *page 82*), here's the Build-A-Toy criteria: originality, durability, craftsmanship, kid appeal, safety, and finish. Meeting them always presents quite a challenge. Those that don't lose points.

As you can see, it takes all kinds of entries to make a great contest. So why not give it a whirl? You've still got time to enter the 1997 version of Build-A-Toy. The deadline for entries is September 1. And you'll have the chance to win over $22,000 in woodworking tools and supplies. Plus, your entry automatically makes you eligible for a bonus prize drawing. (See the October 1996 issue of *WOOD* magazine for rules, entry form, and prize details. Or write Build-A-Toy, *WOOD* Magazine, 1912 Grand Ave., Des Moines, IA 50309-3379 for all you need to enter. Fax 515/284-2115.)

To all who entered the 1996 Build-A-Toy contest, we at *WOOD* offer a round of applause. To those thinking of entering for 1997, we urge you on (and get started soon).

George Cole's walnut and maple steamroller caught the eye of judges for Third Prize in Home Hobbyist.

Crafted with great skill was Neil Seely's 1920s-era ferryboat that took the professional division's Grand Prize.

Mike Jagielo's bedbug pull toy kept the judges laughing, and won him the First Prize, professional.

The Junior Craftsman Grand Prize went to Elton Eby. His crane actually has a working boom.

Resawing Made Simple

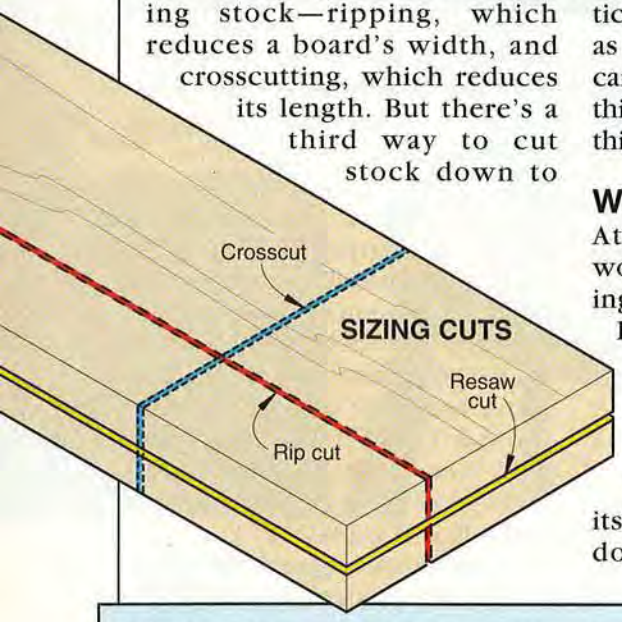
The no-sweat way to thinner stock

When you just can't find the thin stock you need for a project, think resawing. Here's how to do it, using an easy-to-build jig.

The splitter keeps the stock from binding against the blade, and the upper guide assembly helps hold the stock against the fence. Use a pushstick and feather board for safety.

What is resawing?

Woodworkers routinely perform two sawing operations when sizing stock—ripping, which reduces a board's width, and crosscutting, which reduces its length. But there's a third way to cut stock down to size—resawing, which reduces its thickness, shown *below left.*



Though less commonly practiced, resawing is just as useful as ripping or crosscutting. You can resaw standard ¾"- or 1⁄16"-thick boards into ½", ⅜", or even thinner stock for small projects.

Which saw for resawing?

At first glance, the bandsaw would seem best suited to slicing edgewise through a board. But a tablesaw equipped with a resawing jig like the one shown in use *above* offers several advantages, even when cutting wide stock.

The tablesaw's biggest plus is its rigid, true-running blade. It doesn't wander through the wood, as even a wide bandsaw blade will. Though the tablesaw cuts a wider kerf than the bandsaw, it leaves a much smoother surface. (We found that a 24-tooth, carbide-tipped rip blade does the best job.)

You probably would plane or sand away almost as much wood making the bandsawn stock ready for use. And, less planing and sanding means the job goes faster and easier.

The trick to resawing on a tablesaw is, of course, safely guiding stock that's standing on its narrowest surface past the blade. A simple jig will help you do this without twisting or tilting the stock, which would cause binding, burning, and kickback.

Resawing vs. planing

When deciding whether to resaw stock or plane it to thickness, consider both resawing capacity and the amount of wood wasted.

Capacity. Most 10" tablesaws can resaw stock up to about 6" wide with our jig; the typical portable planer can handle material up to 12" wide. You could resaw stock wider than 6" by sawing to the saw's maximum cutting depth, then finishing the job with a handsaw.

Waste. You lose 3⁄16" or so of the stock's thickness to the blade kerf and final surfacing when resawing. If you would have to plane away more than that to achieve the desired thickness, resawing is more economical. For example, in making ¾" stock into ⅜" material, resawing yields the ⅜" stock as well as a 3⁄16"-thick piece that could be finished to ⅛". Planing would produce the ⅜" stock and waste ⅜" as chips.

Here's how to build the jig

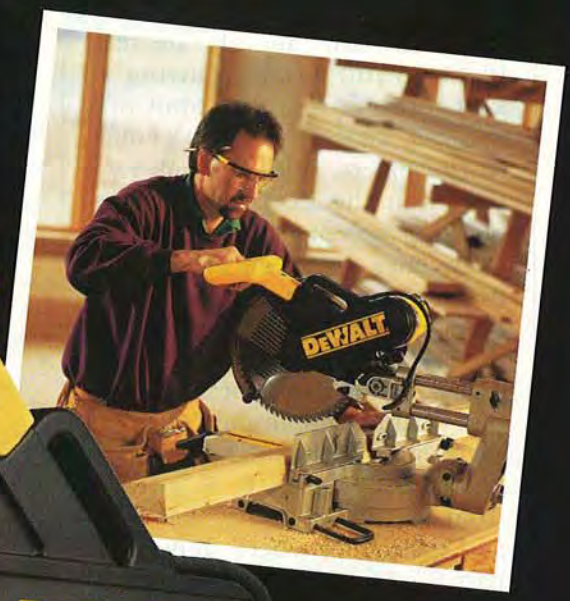
The resawing jig has two main assemblies, the base and the fence, shown in the Exploded View drawing on *page 12.*

Build the base first. Cut a flush-fitting wood insert (A) for your tablesaw's throat. Next, cut the jig table (B) to fit between the miter-gauge slots on your saw. Lower the blade all the way, then lay the insert into the saw throat and clamp the jig table in position on the saw table.

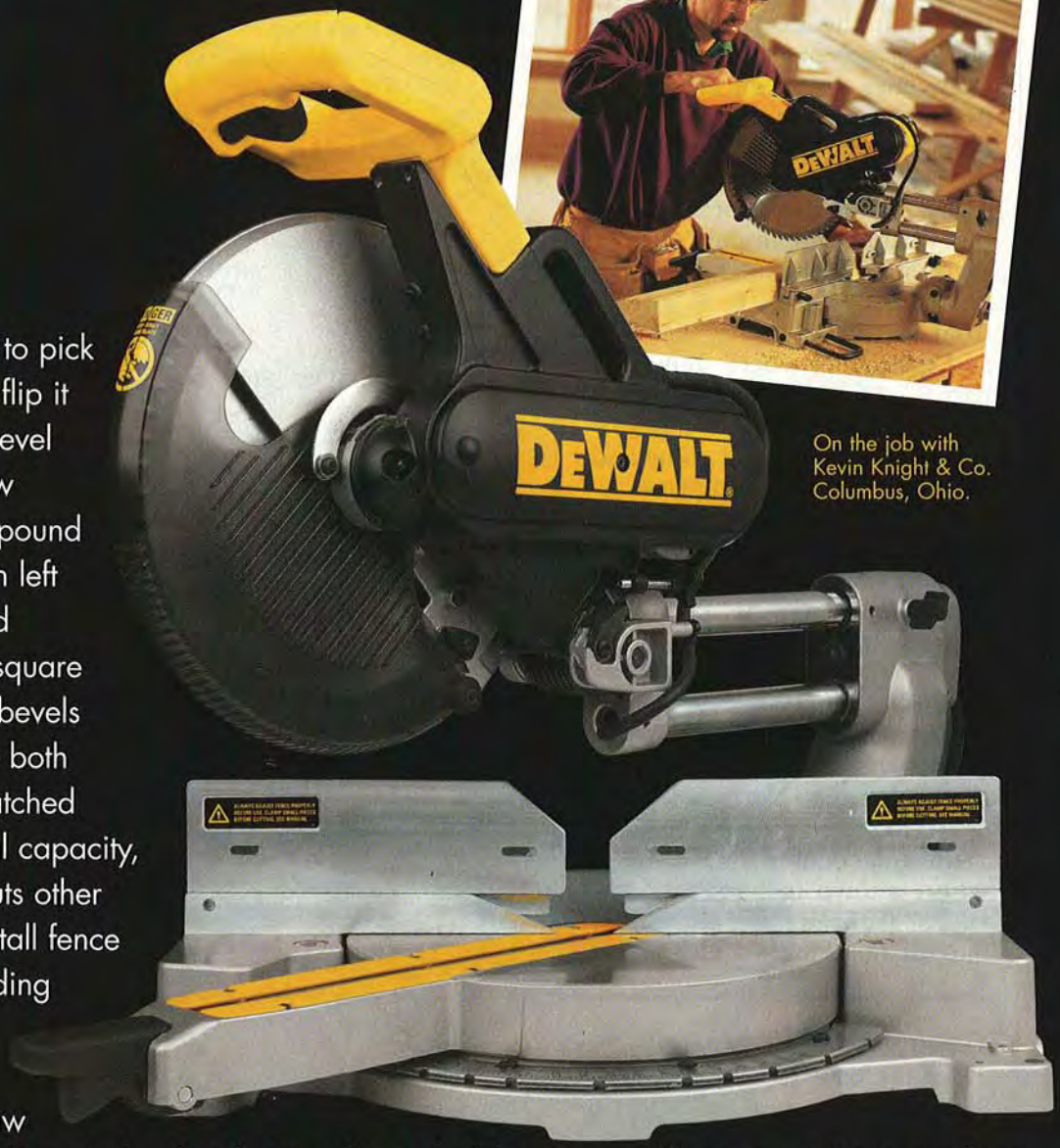
Continued on page 12

THE NEW DW708 12" SLIDING COMPOUND MITER SAW FROM DEWALT

FLIP THE SAW. NOT THE WORK.



On the job with
Kevin Knight & Co.
Columbus, Ohio.



Now, you don't have to pick up your material and flip it around to make the bevel cut you need. The new DW708 Sliding Compound Miter Saw bevels both left and right. And, to end frustration with out-of-square corners, the DW708 bevels beyond 45° to 48° in both directions. With unmatched vertical and horizontal capacity, the DW708 makes cuts other miter saws can't. The tall fence allows you to cut molding up to 5-1/4" standing vertically against the fence. And, the saw glides smoothly on dual vertical rails utilizing a linear ball bearing and bronze guides to easily cut stock up to 12" wide. The easy-to-see stainless steel miter scale has eleven positive stops and an unprecedented cam-action miter locking system. It's not just a miter saw. It's a DEWALT. For more information, call 1-800-4-DEWALT.

DEWALT
High Performance Industrial Tools

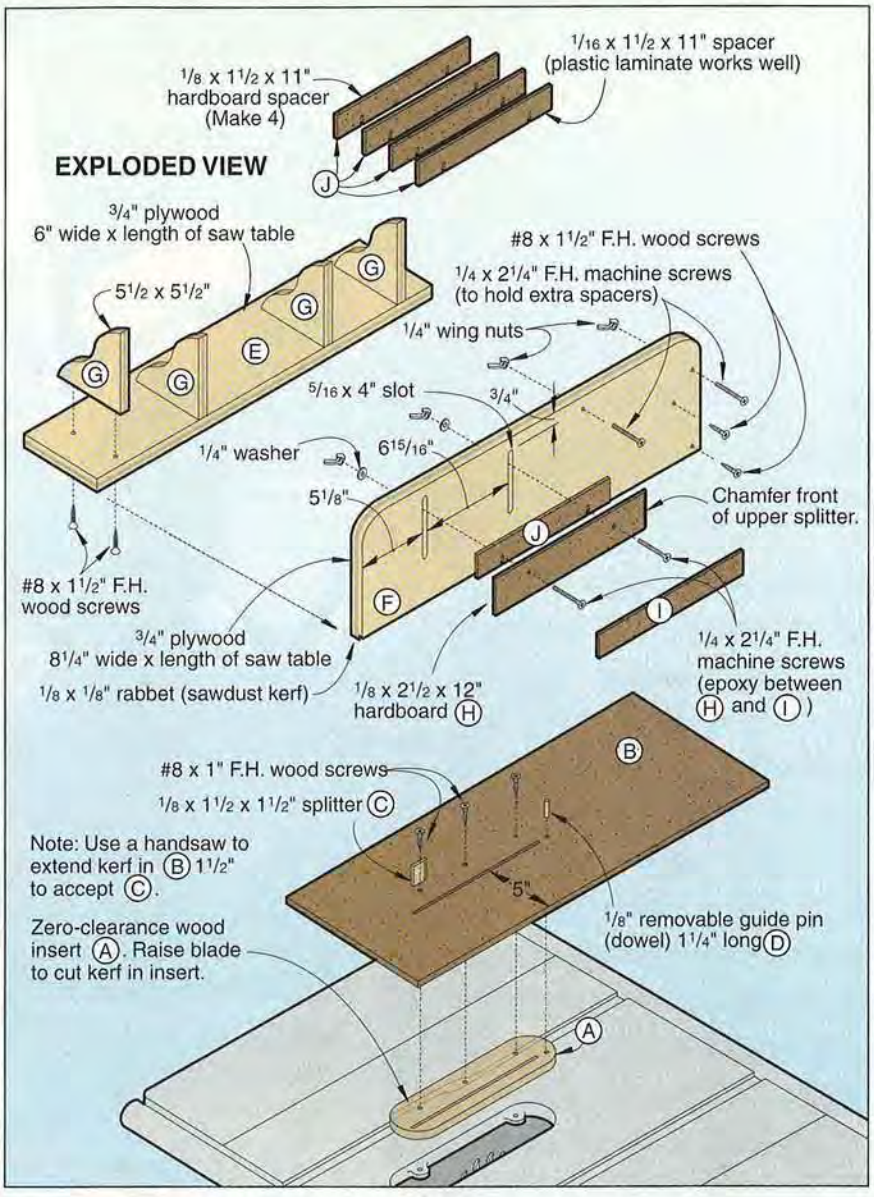
Continued from page 10

Start the saw, and elevate the blade to full height, cutting a kerf through A and B. Shut off the saw, and screw the jig table to the insert. With a handsaw, lengthen the kerf behind the blade to accept the splitter (C). Draw lines to extend the kerf in front of the blade, and drill a ⅛" hole between them for the guide pin (D). Cut out the splitter and a piece of ⅛" dowel for the guide pin. Chamfer the leading edge of the splitter, and glue it in place.

Cut fence parts E, F, and G from ¾" plywood. Cut the slots and the rabbet where shown on part F, and round the upper corners. Glue and screw E and F together at exactly 90°. Glue and screw the braces (G) in place.

Cut the upper guide parts (H and I) and the ⅛" and 1/16" spacers (J) to size. Chamfer the leading edge of part H. Drill and countersink two holes through part H, spaced to match the slots in part F. Epoxy-glue a pair of ¼×2¼" flathead machine screws into the holes, and glue part I over the heads. Notch the spacers (J) to match the slot spacing.

Drill and countersink two holes where shown in part F. Epoxy ¼×2¼" flathead machine screws into the holes for spacer storage.


EXPLODED VIEW
1/16 x 1 1/2 x 11" spacer (plastic laminate works well)
1/8 x 1 1/2 x 11" hardboard spacer (Make 4)
J
3/4" plywood 6" wide x length of saw table
5 1/2 x 5 1/2"
G
E
#8 x 1 1/2" F.H. wood screws
1/4 x 2 1/4" F.H. machine screws (to hold extra spacers)
1/4" wing nuts
5/16 x 4" slot
3/4"
1/4" washer
6 15/16"
5 1/8"
Chamfer front of upper splitter.
F
I
#8 x 1 1/2" F.H. wood screws
3/4" plywood 8 1/4" wide x length of saw table
1/8 x 1/8" rabbet (sawdust kerf)
1/8 x 2 1/2 x 12" hardboard H
1/4 x 2 1/4" F.H. machine screws (epoxy between H and I)
B
#8 x 1" F.H. wood screws
1/8 x 1 1/2 x 1 1/2" splitter C
Note: Use a handsaw to extend kerf in B 1 1/2" to accept C.
5"
1/8" removable guide pin (dowel) 1 1/4" long D
Zero-clearance wood insert A. Raise blade to cut kerf in insert.
A

Resawing with the jig

Place the base assembly on your saw table, and raise the blade to about 1½" above the surface. Select a spacer or combination of spacers equal to the thickness you want for the resawn stock. To allow extra thickness for final surfacing, add a thin plastic or cardboard spacer (about 1/16").

Sandwich the spacers between the fence and the saw blade, as shown *right*. Ensure that the fence stands at 90° to the base; if it doesn't, shim it. Clamp the fence in place, and remove the spacers from behind the blade.

Insert the spacers between the upper guide and the fence, and tighten the wing nuts. Remove the guide pin from the base.

Set up a feather board as shown. Lower the saw blade to ½" above the surface (it needs to be higher than the top of the splitter), and make the first cut. Feed the stock with a pushstick.

For the next cut, flip the stock end for end, keeping the same face against the fence. Bring the upper guide down to engage the kerf in the stock. (The upper guide holds the top of the sawn stock against the fence.) Saw the next pass, then install the guide pin in the base. (This helps prevent saw gouges on the end of the stock.) Continue cutting alternate edges, raising the blade for each succeeding pass.

To set the fence, place spacers between it and the blade. Clamp the fence, then put the spacers behind the upper guide.

Illustrations: Roxanne LeMoine; Lorna Johnson Photographs: Dean Tanner

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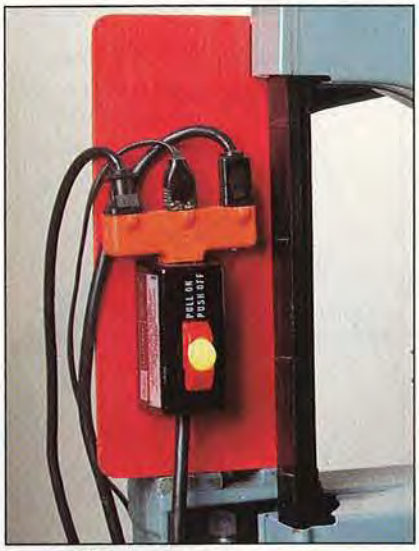
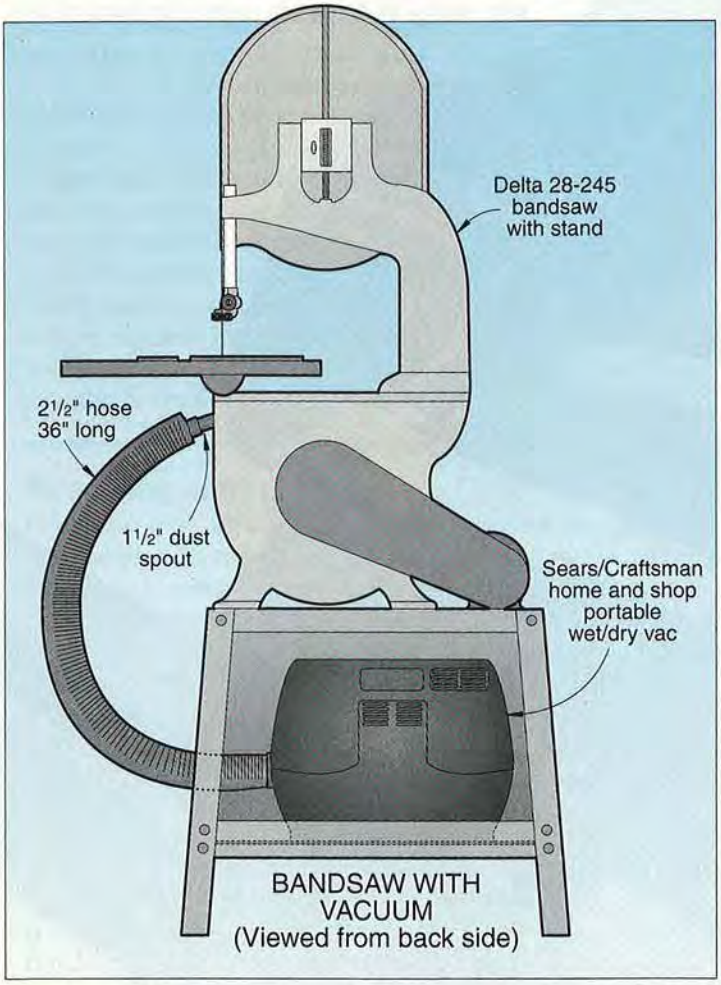
ONE SOUPED-UP BANDSAW

Dust control from down under



When building *WOOD®* magazine projects, we make each tool work extra hard. To make our bandsaw more efficient, we mounted a Sears outlet switch (part no. 60382, Division 9, source no. 113) and connected a three-outlet adapter to one end as shown in the photo at *right*. By just flipping the one switch, we can turn the bandsaw, light, and vacuum all at one time on or off.

For dust control, we've fitted the base cavity of our Delta 14" bandsaw stand with a Sears Craftsman Portable Wet/Dry Vacuum (cat. no. 113.177571) as shown *below right*. Then, we connected it to our bandsaw dust port with 2½" flexible hose (we cut the 10'-long hose to 3') and adapters (cat. no. 16909). Although not necessary, we enclosed the vacuum to make it less noticeable and reduce the noise. If your bandsaw base doesn't have room for a vacuum, set the vacuum alongside and still make use of the switch and three-saw adapter.



Project Design: Chuck Hedlund; Erv Roberts Illustration: Lorna Johnson; Kim Downing Photographs: Studio Au

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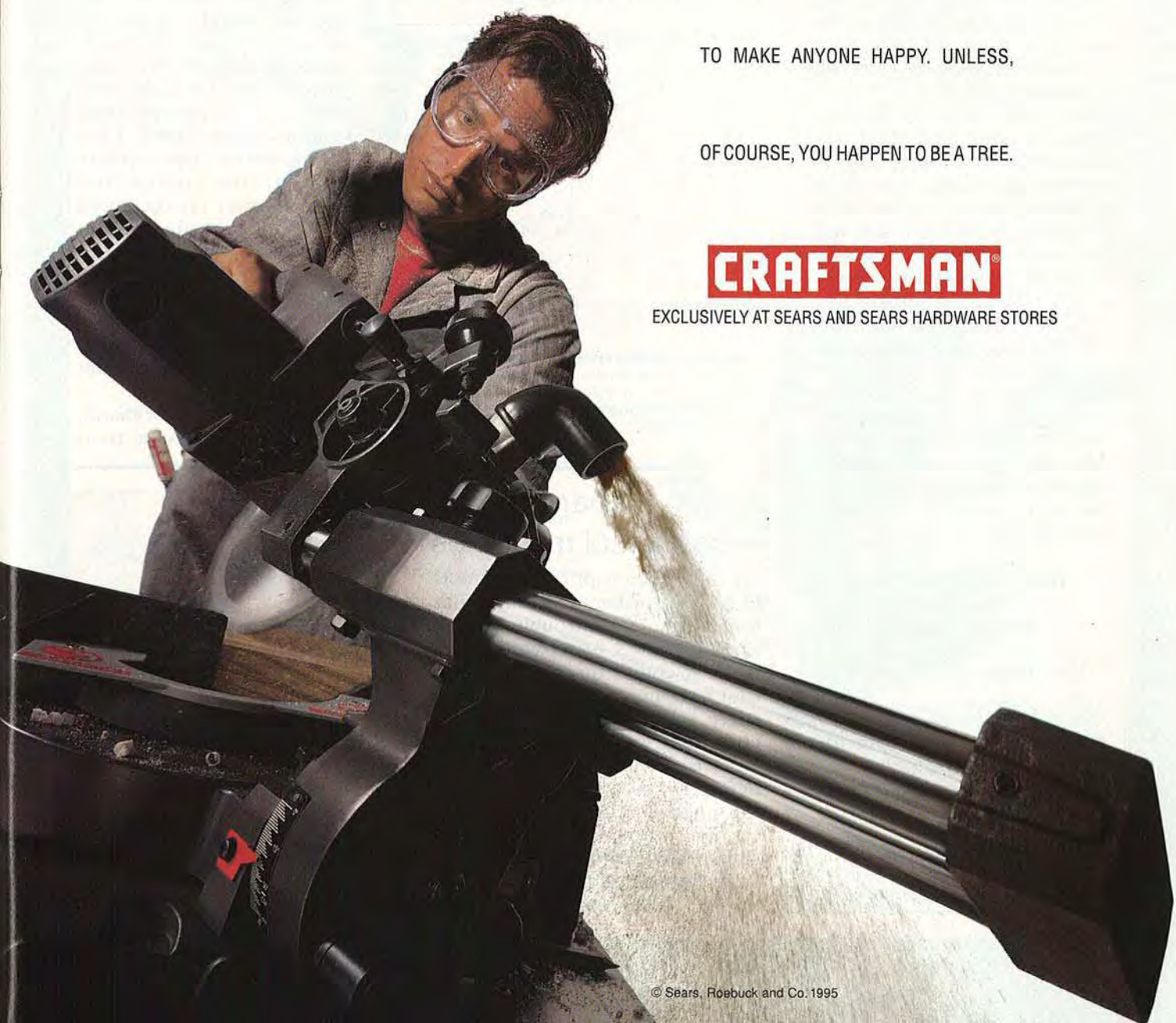

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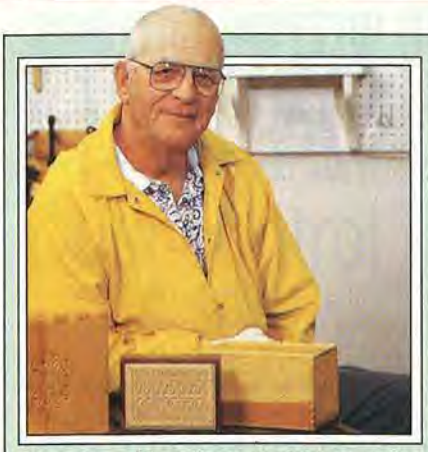


Top Shop Tip winner Paul Tidwell displays some of his chip-carving.

When Paul Tidwell first entered a woodworking shop in 1941, it wasn't by choice. As a high school freshman, he found himself enrolled in his high school's mandatory two-year "woodshop" class.

But that required training struck a cord with Paul, and he's still woodworking 56 years later. He decorates some of his projects, such as a set of wooden stools, with chip carving, and that's what led him to discover the winning tip at *right*.

Your solution to a particular woodworking problem may be worth $40. If it's selected as the Top Shop Tip, you'll win a tool prize valued at $250 or more, and we'll include your photo in this column. To submit a tip, send a letter, containing your daytime phone number, and a photo or drawing of your idea, to:

Tips From Your Shop (And Ours)
WOOD® Magazine
1912 Grand Ave.
Des Moines, IA 50309-3379

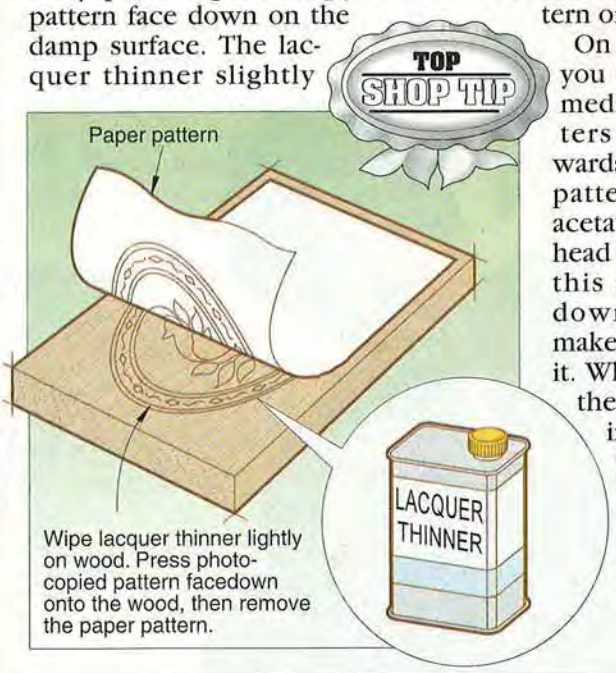
We try to publish original shop tips, so please send your idea only to *WOOD* magazine. Also note that we cannot return submissions. Thanks!

Kerry Gibson
GENERAL-INTEREST EDITOR

Transfer patterns with lacquer thinner

When I first started chip carving, I enjoyed every aspect except one—transferring the detailed pattern to the workpiece. I tried "ironing" a photocopy onto the wood, but I didn't like the results. So, I came up with my own method that works great for both detailed and simple patterns.

First, I wipe down the workpiece lightly with a rag dipped in lacquer thinner. Then, I immediately press a photocopy of the pattern face down on the damp surface. The lacquer thinner slightly dissolves the photo-copy's toner, leaving a crisp outline of the pattern on the wood.


TOP
SHOP TIP
Paper pattern
LACQUER
THINNER
Wipe lacquer thinner lightly on wood. Press photocopied pattern facedown onto the wood, then remove the paper pattern.

On patterns with lettering, you need to make an intermediate pattern or the letters will come out backwards. I make this "reverse" pattern first on a sheet of acetate film used with overhead projectors. Then, I put this acetate copy upside down in the copier, and make a paper photocopy of it. When I apply this copy to the workpiece, the lettering transfers correctly. If your copier has a manual setting, I've also found that "light" copies transfer better than "dark" ones.

—Paul W. Tidwell, Huntsville, Texas

For submitting the Top Shop Tip, Paul Tidwell receives a Bosch model 1275DVS, 3×24", variable-speed belt sander. Congratulations, Paul!

Sign-out board solves missing tool mysteries

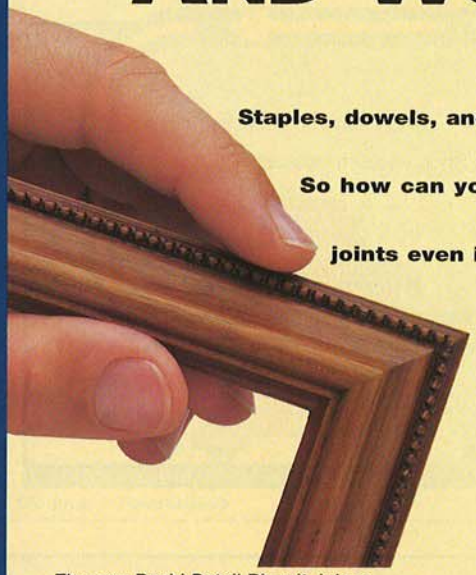
I'm more than happy to loan tools to a friend or family member. But sometimes, I have trouble remembering who's borrowed what when it comes time to reclaim a tool for one of my projects. To solve such mysteries, I hung a clipboard with a sign-out sheet next to the door of my shop. Before a tool goes out the door, the name of the borrower, and the date borrowed, goes on the sheet so I know who to call when I need it back.

—Denny Feller, Strasburg, Ohio

Continued on page 18

THE NEW RYOBI DETAIL BISCUIT JOINER

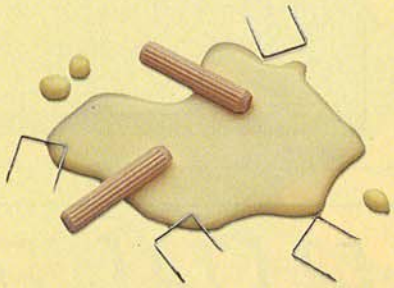
THE DIFFERENCE BETWEEN WOODWORKING AND WOODNOTWORKING.



The new Ryobi Detail Biscuit Joiner uses miniature "Accu-biscuits" for neat, tight, professional joints.

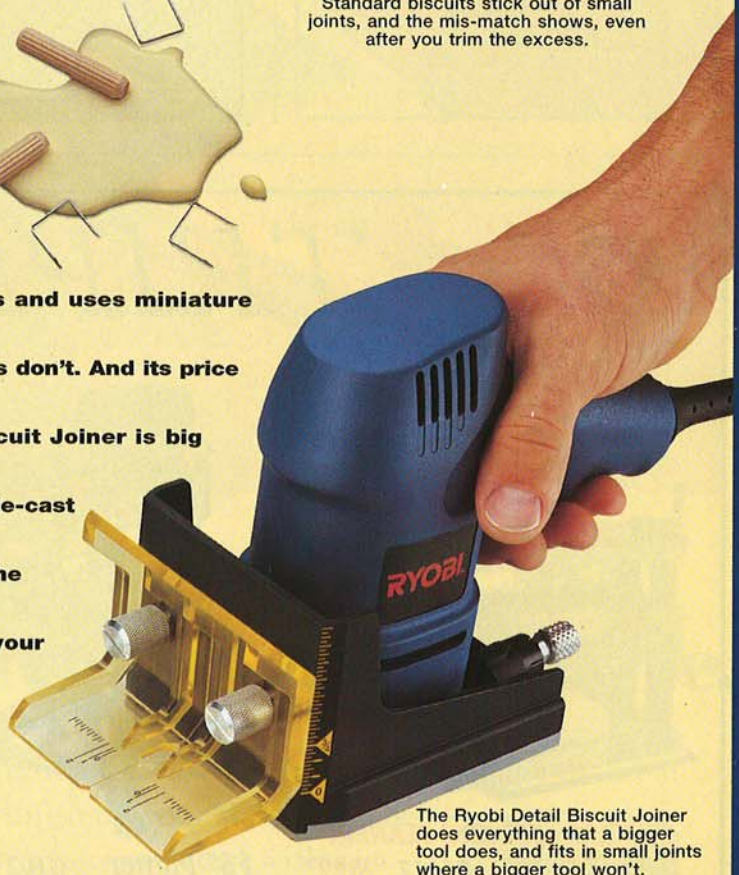
Staples, dowels, and glue won't do. Standard-size biscuits won't fit. So how can you make neat, tight, professional joints even in small stock? With Ryobi's new Detail Biscuit Joiner, that's how.

Standard biscuits stick out of small joints, and the mis-match shows, even after you trim the excess.



This compact powerhouse cuts smaller slots and uses miniature "Accu-biscuits™" to fit where standard biscuits don't. And its price is as small as its biscuits. But the Detail Biscuit Joiner is big on performance, from its beefy motor to its die-cast base and see-through fence. So see the new Ryobi Detail Biscuit Joiner at your local home center. It'll get your wood working like never before.

Ryobi "Accu-biscuits" (actual size).



The Ryobi Detail Biscuit Joiner does everything that a bigger tool does, and fits in small joints where a bigger tool won't.

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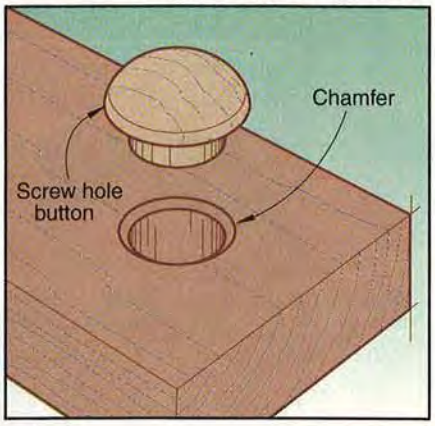
Continued from page 16

Chamfer holes to seat screw hole buttons

I often use Shaker pegs and screw hole buttons, and always have trouble getting them to seat firmly on the board. Now, I use a countersink bit to slightly chamfer each hole, which creates a void for glue squeeze-out and helps the buttons seat properly.

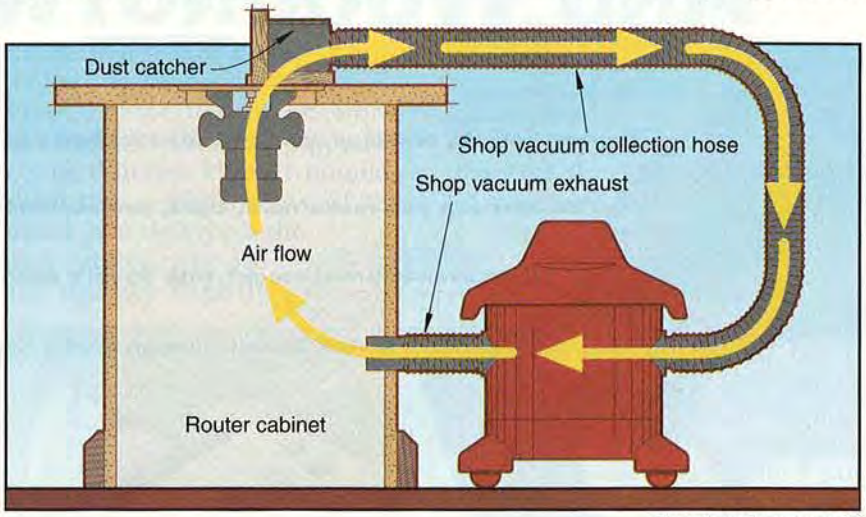
—Donald Daily, Paragon, Ind.



Shop vacuum exhaust helps clean, too

When I built my router cabinet, I made the compartment right under the router airtight except for an inlet in the side of the cabinet and the router bit port. Using an extra piece of hose, I connected the exhaust port of my shop vacuum to the cabinet inlet so the exhaust air blows up and out through the router bit port. The extra boost from the exhaust forces wood chips toward the collection hose, which attaches to the fence by the router bit, and helps keep the worktop clean.

—Robert Field, Springfield, Ohio



Continued on page 20

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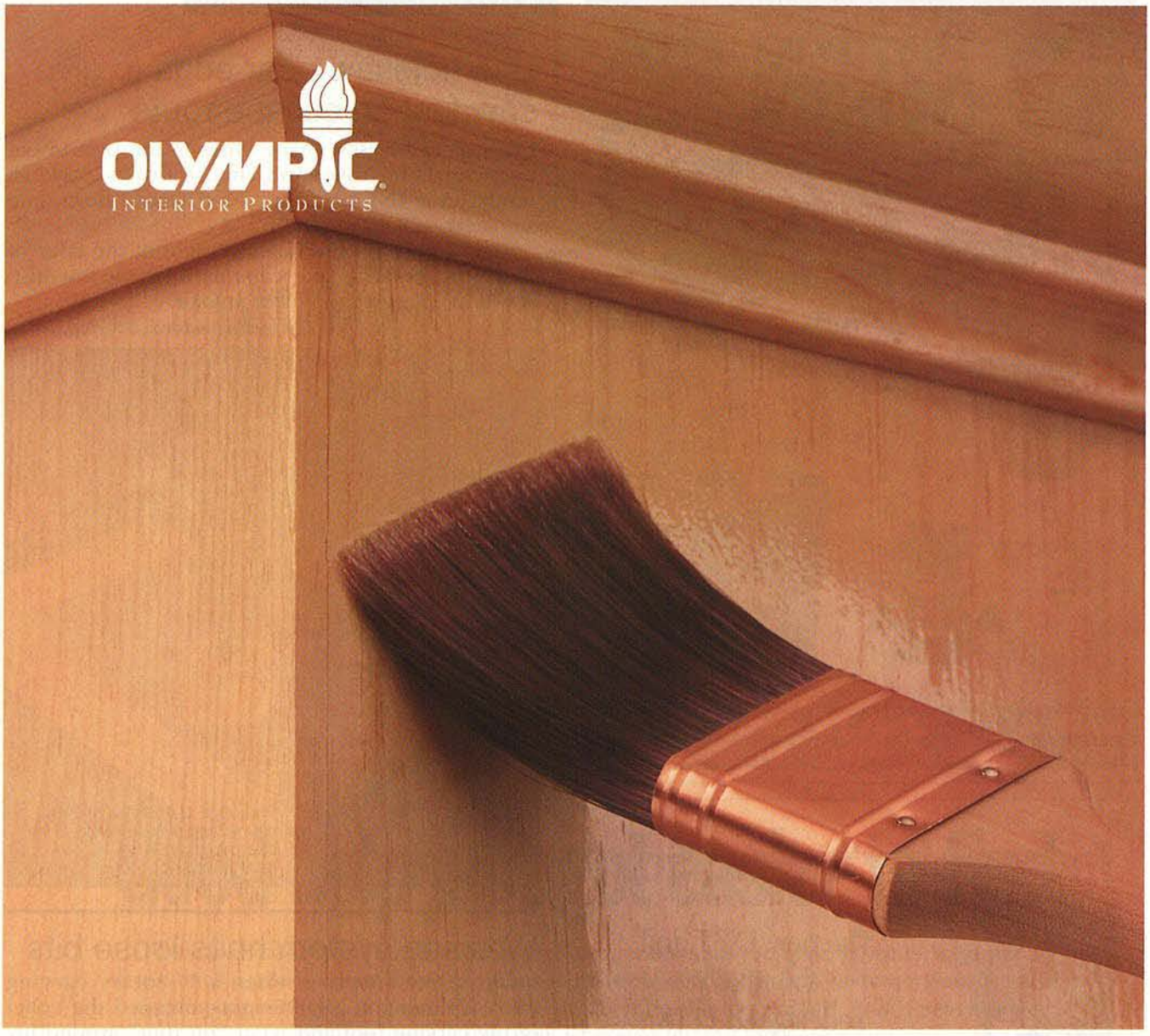

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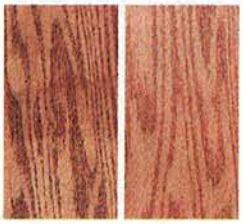

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TIPS FROM YOUR SHOP (AND OURS)

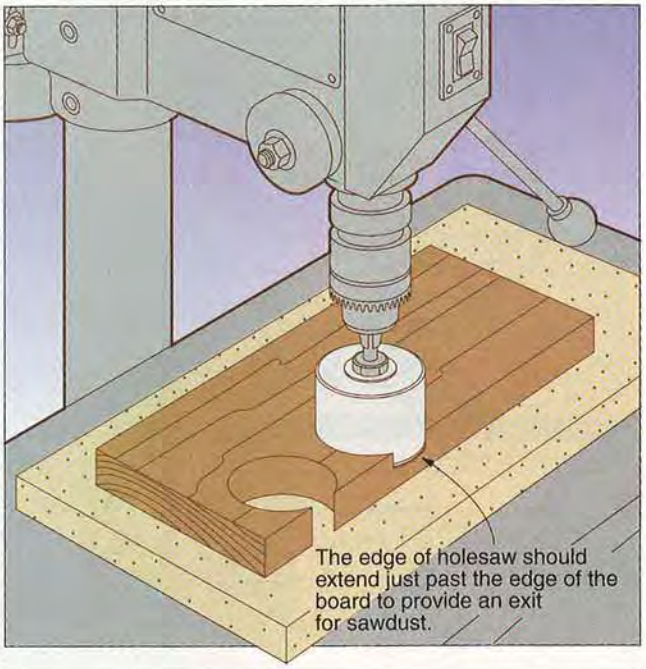
Continued from page 18

Use holesaw near edge to give sawdust an escape route

I've used a holesaw many times in the past to cut out wheels for toys. And almost always, sawdust would clog the saw, the wood would burn, and smoke would fill my shop.

Now, I position the holesaw right at the edge of the stock, creating an escape path for the sawdust. No more clogging, no more smoke.

—John Santoro, Billerica, Mass.

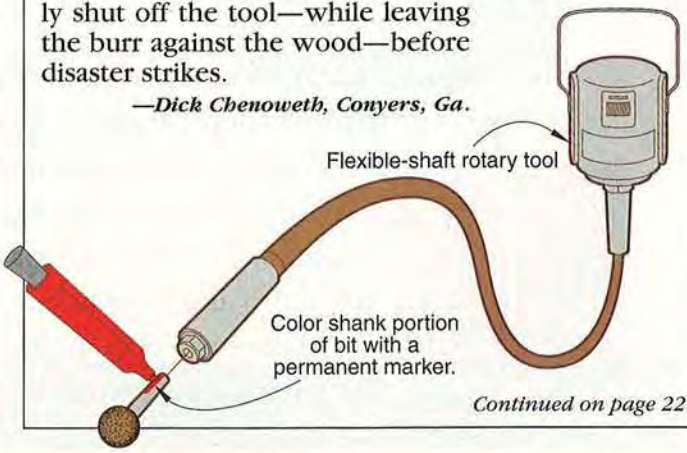


Warning system halts loose bits

Imagine my surprise when a 1" rotary carving burr—spinning at 18,000 rpm—escaped the collet of my carving tool and went "on tour" around my workshop. Lucky for me, it wasn't hungry for meat.

That moment inspired me to come up with a warning system. I use a red felt-tip marker to color the portion of the shank normally covered by the collet. If that color appears while I'm carving, I know the bit has worked itself loose. I immediately shut off the tool—while leaving the burr against the wood—before disaster strikes.

—Dick Chenoweth, Conyers, Ga.



Continued on page 22

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Circle No. 37

TIPS FROM YOUR SHOP (AND OURS)

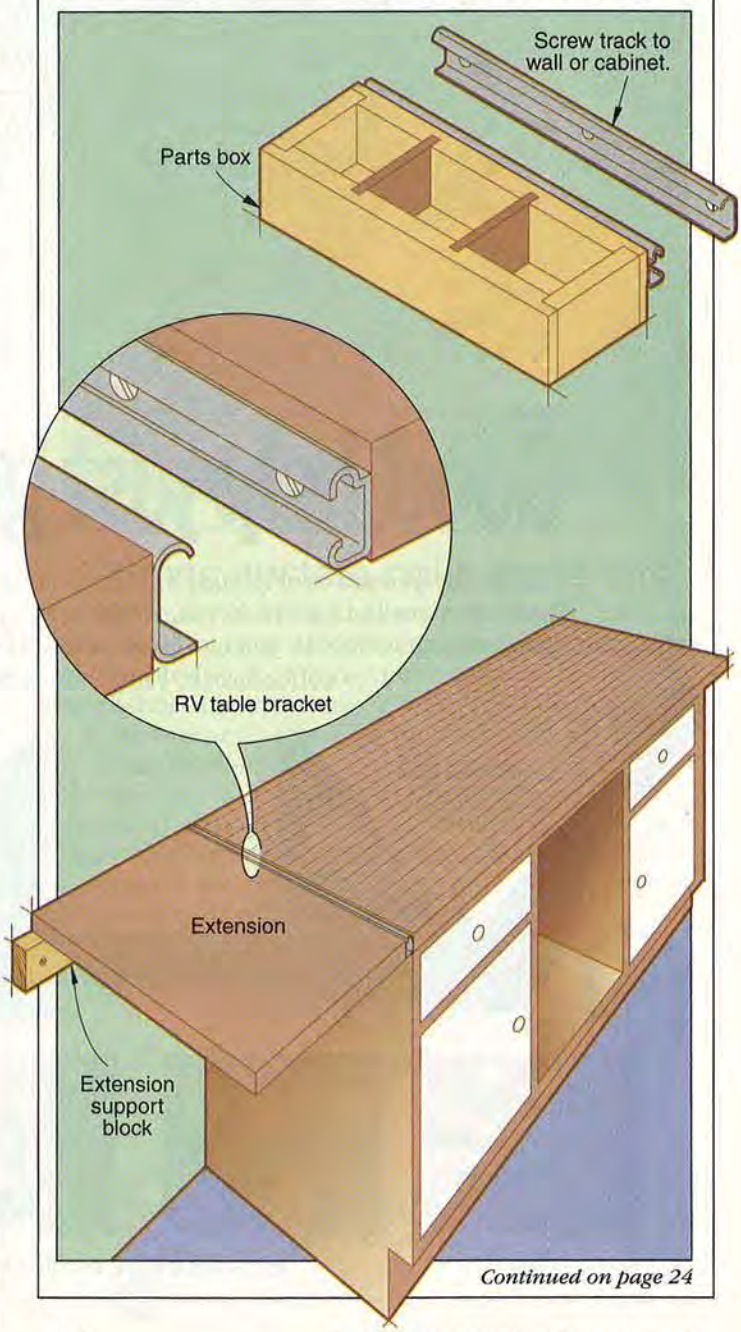
Continued from page 20

RV table brackets useful for a variety of shop applications

Pegboard and hooks work fine for holding individual tools, but when I wanted to mount some removable parts boxes and racks, I turned to my local recreational vehicle supply outlet. Many RV's come equipped with tables that mount on a track system that allows you to lift the table off and convert the dining booth into a sleeping berth.

I mounted the track to the wall and box, as shown *below*, so the box simply lifts off and goes with me to my jobsite. I also installed the track on the end of my workbench to make expanding the worksurface a snap.

—Denny Feller, Strasburg, Ohio



Continued on page 24

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Continued from page 22

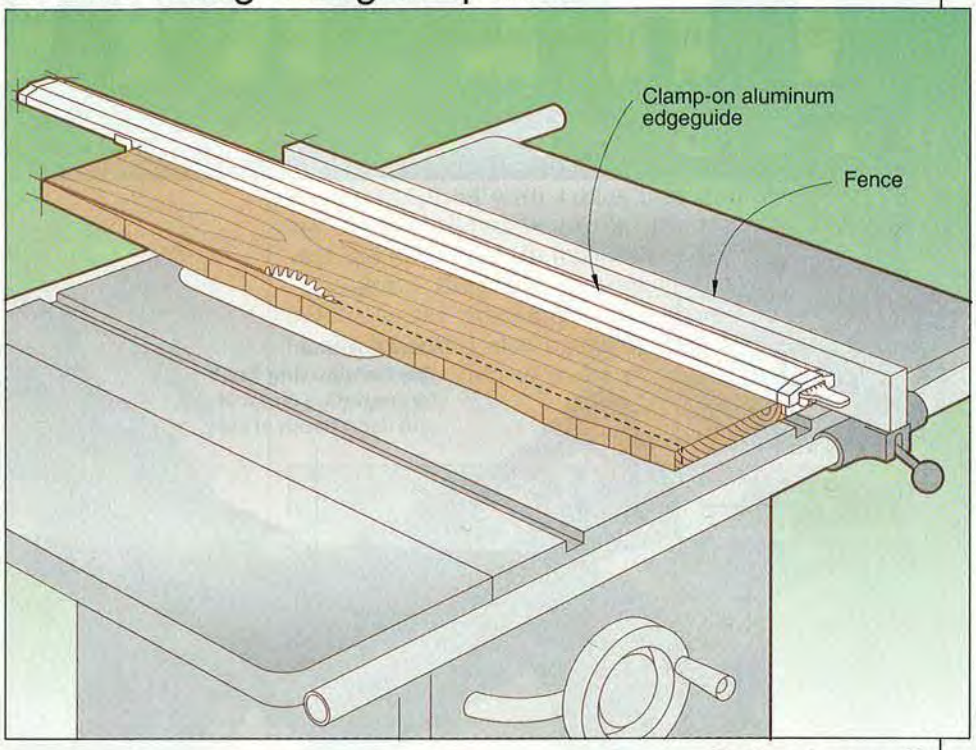
Use clamp-on edge guide for straight-edged rip cuts

I tried several methods for ripping rough-edged boards on my tablesaw, with mixed success. Then, while I was using a clamp-on aluminum edge guide and my circular saw to cut up some plywood, it occurred to me that the answer to my ripping dilema was right in front of me.

Now, to rip a straight edge on a board, I first clamp the edge guide to the workpiece so it overhangs the edge of the board slightly. With the edge-guide lined up firmly against the tablesaw fence, I get straight-edged rips everytime.

By the way, I have a 48"-long Tru-Grip Clamp 'N Tool Guide, available through many woodworking catalog companies. The guide also comes in 24" and 36" lengths.

—Glenn Sperry, Vista, Calif.



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Club Cab Sport 4x4

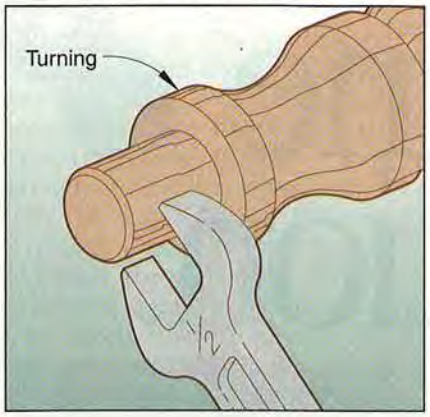
The New Dodge Dakota
It's full of surprises.

Continued from page 24

Wrenches make quick, accurate calipers

Rather than constantly readjust my calipers when making small turnings, I keep a set of open-end wrenches at my lathe. The jaws of the wrenches fit into most spots and save me from resetting my calipers, particularly when I do repetitive spindle work.

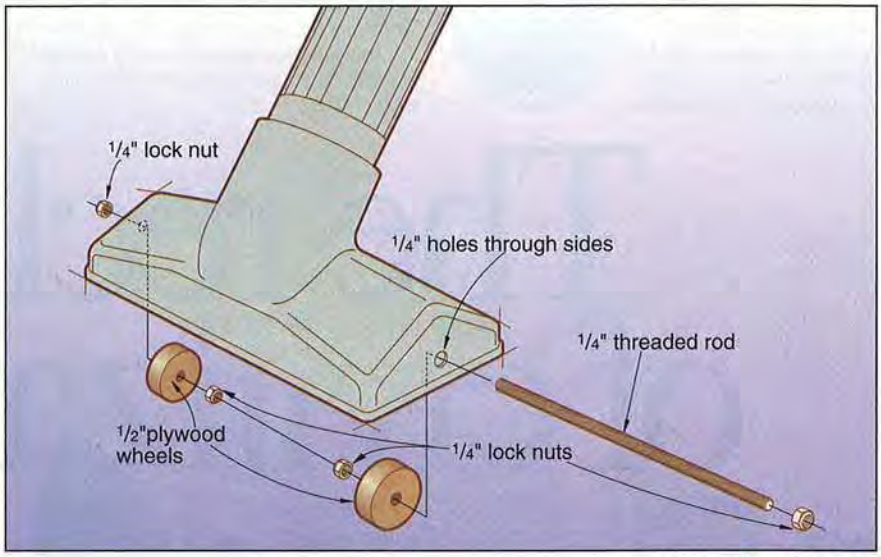
—Marwin Feldman, Amherst, NY



Free-wheeling floor nozzle keeps on moving

It's great to have a powerful shop vacuum, but I often battled with mine to keep it from sucking the floor nozzle tightly to the shop floor. I solved the problem by mounting a set of small plywood wheels to the underside of the nozzle, as shown *below*. The wheels roll easily across the floor, even through debris, and keep the nozzle from attaching to the floor.

—Wilbur Rath, Shiocton, Wis.



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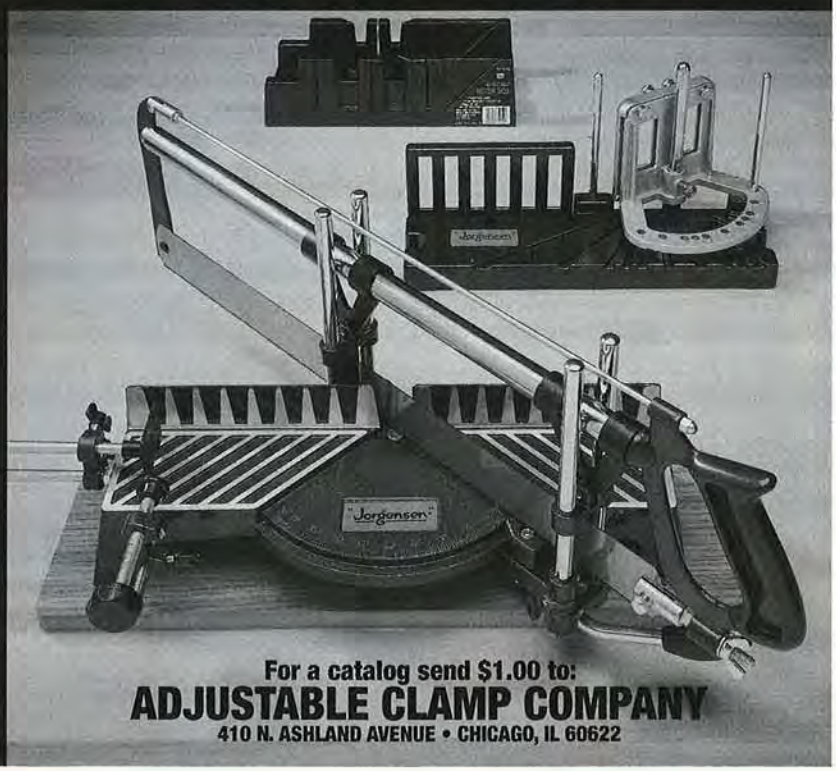

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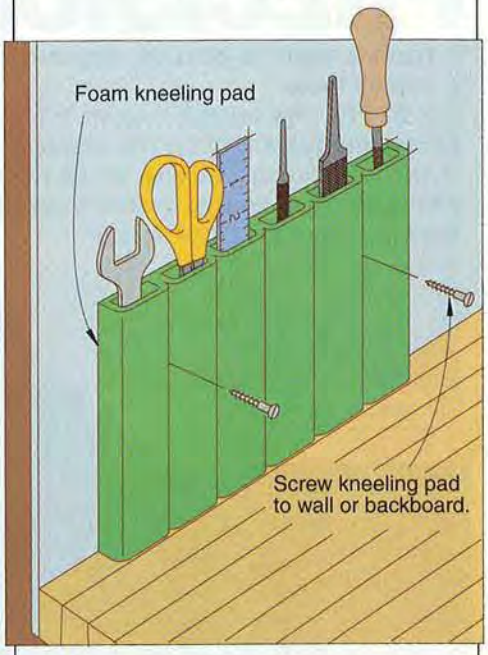
TIPS FROM YOUR SHOP (AND OURS)

Continued from page 26

Foam kneeling pad keeps benchtop clear

I recently found something among my gardening tools that works great for organizing workbench clutter. I mounted a foam kneeling pad on the wall above my workbench, as shown *below*. Files, metal rules, scissors, and other tools slip conveniently into the pad's hollow tubes.

— Sarah Phillips, Houghton, N.Y.



A FEW MORE TIPS FROM OUR WOODWORKING PROS

- A formal serving tray like the one in our tea cart's top often comes in handy. If you don't need the whole tea cart, you can build just the tray from the directions on *page 78*.
- Oak wainscoting, available at most homecenters, can be used to make beautiful furniture panels, as demonstrated on the futon recliner, *page 66*.
- See how we designed a special safety latch for our sports locker on *page 49*. Your child can lock it from the outside, but it easily opens from the inside, even when padlocked.

Making music with a propane torch

I'm in the process of building a fretted dulcimer, and I need to find out how to bend the sides to fit the hourglass shape. Can you help me on this?

—Ralph Lawton, Huntington, W.Va.

That's a tall order, Ralph, but we can help. To make the relatively sharp bends required on the dulcimer sides, you will need to soften the wood fibers. Traditionally, luthiers (stringed instrument makers) bend the sides by applying heat and moisture to the wood while bending the stock with a bending iron.

To do this, set up a bending iron like that shown in the drawing at *right.* First, sand the coating off of a 6"-long piece of 2" black pipe (not galvanized) and secure it horizontally in a machinist's vise. Then, place the business end of a propane torch inside the pipe so that the flame strikes the bottom. Placing the flame against the bottom generates enough heat in the top side for bending, without making it so hot that you scorch the wood.

Use a wet cloth or sponge to dampen the section of the workpiece you want to bend. Place the wet area against the bending iron, moving slowly from one end of the bend to the other. Apply light downward pressure as you move the side across the iron. The iron will turn the water to steam, allowing you to bend the wood. Add moisture and continue bending until the piece matches the plan.

For an hourglass-shaped dulcimer, like the one shown *above*, complete the inside bends before moving on to the bends for the upper and lower bouts (wide areas of the body). This method will make the side easier to fit to the pattern as you bend it to shape.

Have a question for our woodworking experts?

No matter how simple or perplexing a woodworking problem you're faced with, we would love to hear from you. We'll do our level best to solve your mystery, and you might even find your question and our reply on this page. You can reach us either by letter or through your computer:

- ***Letters:*** Send your letter to Ask *WOOD*®, 1912 Grand Ave., Des Moines, IA 50309-3379.
- ***E-mail:*** Send your question to us at **woodmail@woodmagazine.com**
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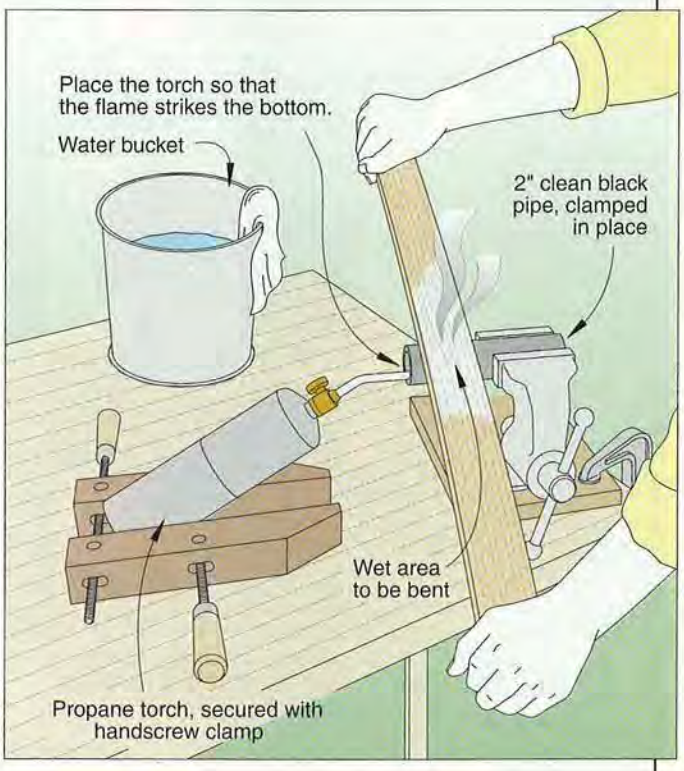
Place the torch so that the flame strikes the bottom.
Water bucket
2" clean black pipe, clamped in place
Wet area to be bent
Propane torch, secured with handscrew clamp

From almost perfect to the perfect finish

I make wooden gameboards, which I finish-sand with 220-grit sandpaper. Then, I wipe down the surface with a tack cloth before applying a water-based polyurethane finish. The finish dries glossy and quite smooth, except for a few bits of matter that mar the surface. What can I use to remove these blemishes and end up with a perfect finish?

—Christopher Clark, Grover Beach, Calif.

Chris, we suggest that you follow your finish sanding by dampening the wood surface with a wet rag. This will raise any grain "feathers" left over from the initial sanding. Follow this by resanding the board with 220-grit sandpaper.

Strain your water-based finish through a filter to remove any globules of cured finish that may cause bumps. Then, apply the finish according to the manufacturer's directions, and allow it to cure.

Smooth the surface with 600-grit wet-or-dry sandpaper, using water as a lubricant. Finally, polish the finish with rottenstone or a commercial polishing compound such as 3M Finesse-It (available from auto-body supply shops) to get that unblemished luster.

Continued on page 30

Print this article

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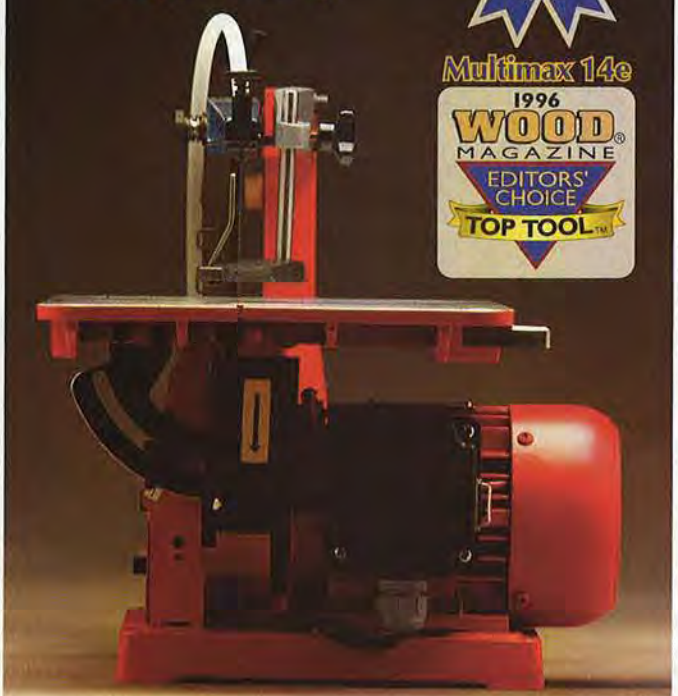

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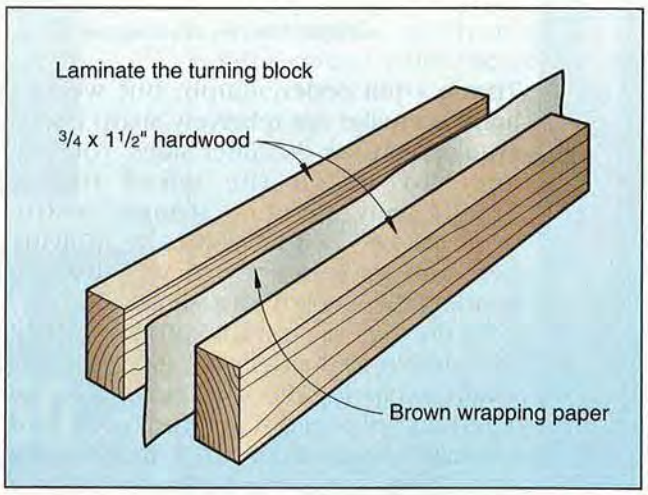
ASK WOOD

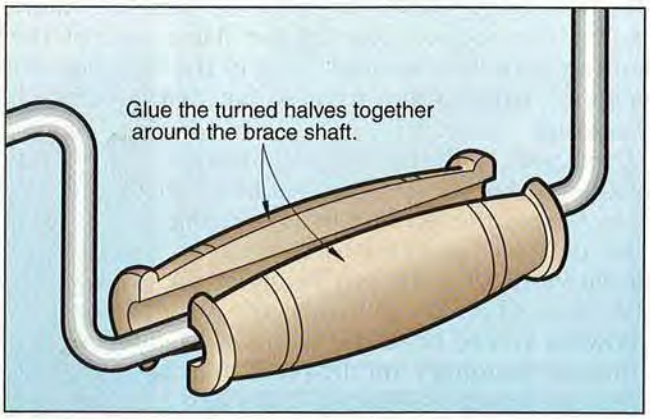
Continued from page 29

Split turning solves a problem

I would like to know how to replace a crank handle on an old brace. I can turn a handle on the lathe, but how can I disassemble the brace to put the handle on?

—Muril H. Moss, Fort Washington, Md.





You probably can't disassemble the old brace Muril. Many of these have a shaft that's a single piece of steel. Instead, we suggest that you use the split-turning approach to making a replacement handle. Here's how to do it:

1 Cut two pieces of ¾" stock, 1½" wide by the length of the handle plus 1".

2 Glue these blocks together with a piece of brown wrapping paper between the faces.

3 Drill the hole for the brace shaft in the center of this lamination.

4 Turn the handle to shape on the lathe. If necessary, reinforce the tailstock end of the block with tape to prevent the lamination from splitting.

5 Separate the two halves at the glue/paper line using a putty knife. Remove the residue of the brown paper by flat-sanding the faces.

6 Place the handle halves on the brace shaft to check the fit. When the fit is right, glue the two halves together on the brace. Sand and finish.

More on dust-collection system grounding

I recently reworked my PVC-pipe dust-collection system while renovating my shop. Being concerned with the build-up of static electricity in this system, I reread the various articles in *WOOD®* magazine on this subject. I still have some questions:

1 How does the grounding of the system work should a "shock" or static spark happen?

2 Do you have to ground the wire at both ends of the system?

3 Can I ground my system to the machinery?

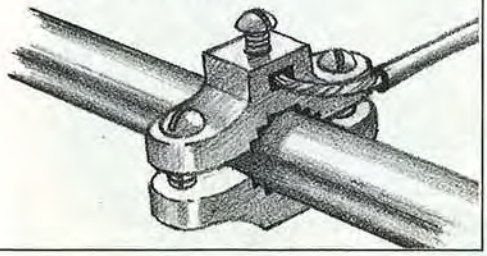
—Pat Leask, Victoria, B.C., Canada

Pat, the grounding system draws off the static electricity. This prevents the kind of "shock" that happens when you kiss your wife after walking across the carpet in your stocking feet.

Static electricity does not require a closed circuit like the electricity we use to run our machines. You just need one point to drain it from the dust-collection system.

Like the telephone and cable companies, we prefer to use a metal waterpipe as a ground. We know the waterpipe passes directly into the earth, where it discharges the static charge.

Power tools don't offer such a clean and simple grounding system. First, to be a good grounding source, the tool must be connected to the ground wire in its power cord. This cord requires a three-prong plug which connects to a three-hole outlet. This in turn must be connected to a three-wire cable or a conduit. Finally, the cable or conduit must be connected to the grounded electrical box..



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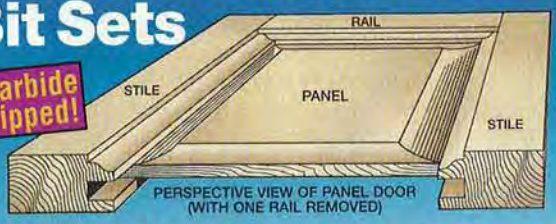

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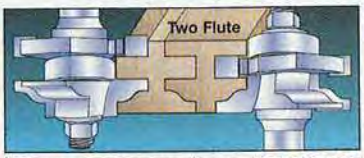

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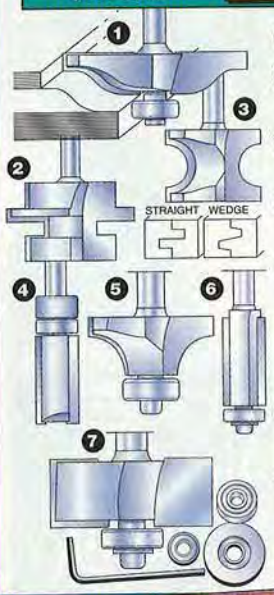

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Dining-Table Duo

Spice things up with our pepper mill and salt shaker

Just as salt and freshly ground pepper accent food, our turned pepper mill and salt shaker will enhance your table setting.

Project prep

Lathe equipment: spur or cup drive center, live tail center, 3–4" faceplate.

Turning tools: ¾" roughing gouge, ⅜" or ½" spindle gouge, ½" or ¾" skew.

Stock: 2½" square stock (we used walnut). The peppermill calls for two pieces, one 5½" long and one 3¼" long. Turn the salt shaker from a piece 6¼" long.

Size the stock to start

Cut the stock for the pepper mill and salt shaker. Select your stock for the best possible grain match between the pepper mill's body and top as well as the best color match among all three pieces.

On each part, locate the center on each end by drawing diagonal lines. Mark the centers with an awl or center punch. Install a drive center on your lathe's headstock and a rotating (live) center in the tailstock.

Mount the 5½"-long blank between centers. Round it to about 2½" diameter. (Leaving some flats on the cylinder doesn't pose a problem right now; in fact, those flats can help you during the drilling operation later.)

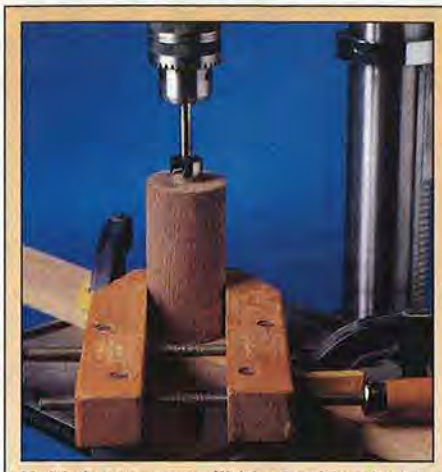
Mark two lines on the turning, the first one ¼" from the headstock end and the other 5⅛" from the same end. This defines a section 4⅞" long, which will be the pepper mill's body.

About 1/16" outside the line at each end of the body, turn the workpiece to ¾" diameter. Then, with a skew chisel or spindle gouge, make a clean cut to the line at each end. Sand the endgrain with 220- and 400-grit sandpaper. Determine which end will be the top of the pepper mill, and dismount the workpiece.

Continued

Print this article

Dining-Table Duo



Hold the pepper mill blank with a handscrew clamp as you bore the center hole. Line up the bit with the center mark on the tenon.

The bottom of the blank fits over the tenon on the jam chuck (right). The plug (left) fits into the bottom hole for mounting the bored blank.

Bore the pepper mill blank

Clamp a piece of ¾"-thick scrapwood to your drill-press table. Bore ½" deep into it with a ¾" Forstner bit.

Now, insert the tenon on the top end of the turning into the hole. Clamp a handscrew onto the body to hold it stationary, as shown *above*. Chuck a 1⅜" Forstner bit into your drill press. Verify that the center of the bit coincides with the center mark on the turning, then bore into the pepper mill body, cutting away the tenon and going ⅜" deep into the body.

Without moving the blank, change to a 1" bit. On the same center as before, bore about halfway through the length of the body. Invert the body, and drill into it from the other end until the holes meet. To drill concentrically, align the bit with the lathe center mark on the end of the remaining tenon.

Complete the mill's body

Remount the bored-out blank on the lathe. To do this, you'll need to construct a jam chuck for the headstock. Here's how.

Bandsaw a disc of 1½–2"-thick scrapwood the same size as your 3–4" lathe faceplate. Attach the disc to the faceplate, mount the faceplate on the lathe, and true the disc's edge and face. Turn a 1⅜"-diameter tenon ⅜" long on the disc, as shown at right in the photo *above*. This tenon must fit snugly into the hole in the bottom of the pepper mill body, so test-fit it as you work.

Mount the workpiece by fitting the large hole in the bottom over the tenon. Engage the live tail center into the 1" hole at the other end. (A conical tail center should hold the end without wobble. If your center doesn't, turn an adapter like the one shown at left in the photo to support the end.)

With the parting tool, cut in to 2¼" diameter at several points along the body. Turn the body to 2¼" diameter. When measuring finished diameters with calipers, shut off the lathe—pushing the calipers over a spinning workpiece can burnish a line on the turning that will take lots of sanding to remove. Then, referring to the Pepper Mill Full-Sized pattern *opposite page*, lay out the details on the turning.

Cut in with the tip of a skew to set the depth and width of the two beads near the base and the one at the top. Form the beads with the skew or a gouge.

Cut in with the parting tool to 1¾" diameter ¾" from the top of the body. Then, shape the long curve along the side. Curve the side into the lower beads.

Sand the body. To minimize cross-grain scratches, turn off the lathe and sand along the grain with 220- and 400-grit sandpaper. Apply an oil finish.

Now, turn the top

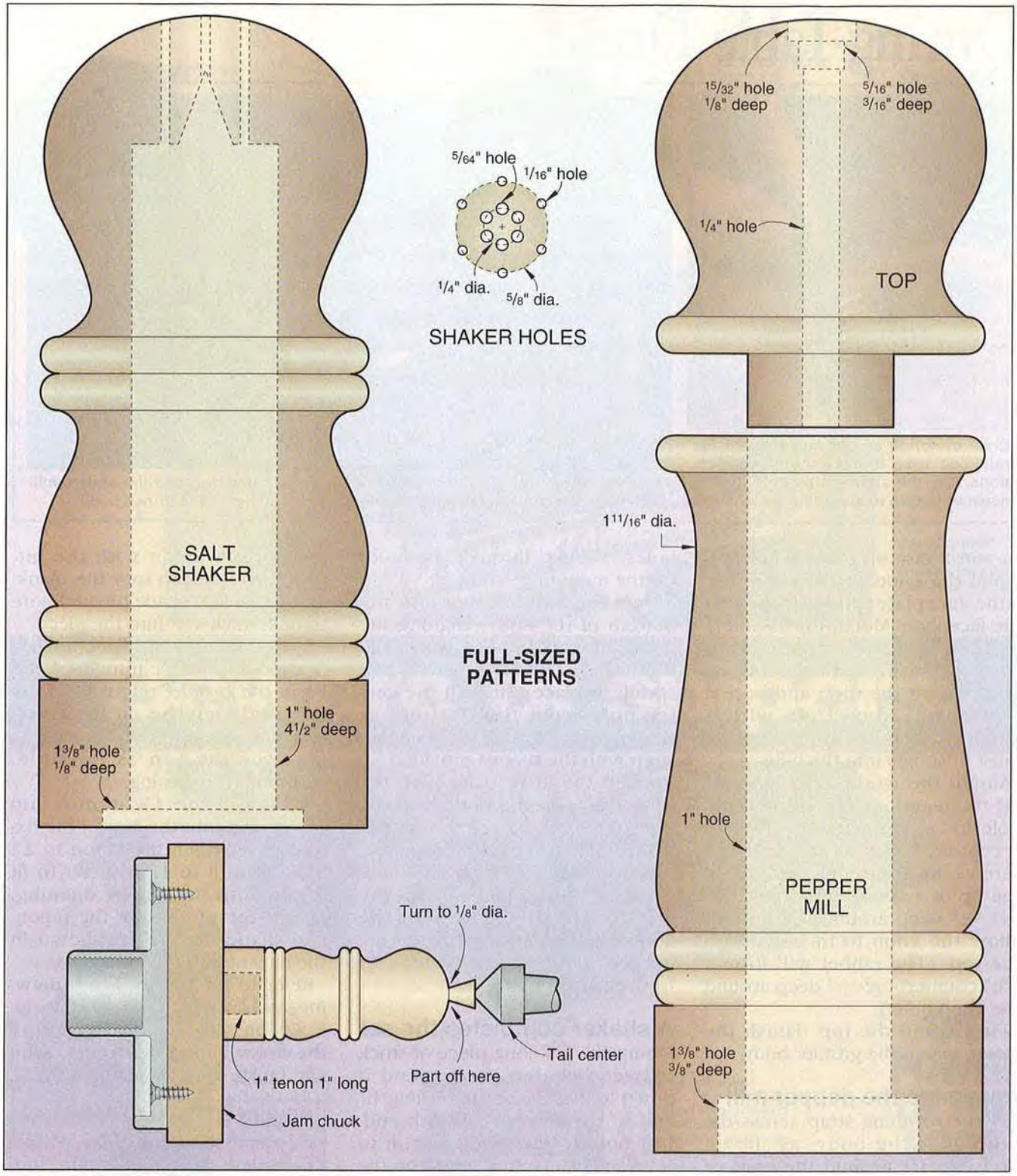
Mount the 3¼"-long blank on the lathe. Place the end that will be the bottom of the part toward the tailstock. Round the stock to about 2½".

Draw a line around the workpiece ½" from each end. Slightly outside each line, cut in to 1⅛" diameter with the parting tool. Turn a 1⅛" tenon out to each end.

At the top (headstock end), turn the tenon down to ¾" diameter, to fit the drill-press fixture. Dismount the workpiece, and fit the tenon into the hole in the fixture. Chuck a ¼" bit into the drill press. Making sure the bit lines up over the center mark on the tenon, drill through the piece.

Remount the workpiece, engaging the tailstock center in the hole in the bottom tenon. If your drive center doesn't hold the drilled blank firmly enough, change to a jaw chuck or construct a jam chuck for the headstock.

Round the piece to 2¼" diameter. Referring to the template, lay



out the details where shown on the turning. Shape the side profile, working as far over the top as possible. (You can undercut the tenon, but don't part it off yet.)

Turn the bottom tenon to 1" diameter. The tenon must make a sliding fit in the 1" hole through the body, without being sloppy. (It's safer here to err toward being a smidgen too large. At assembly time if you can't turn the top freely in the body, you can sand the tenon to loosen it.)

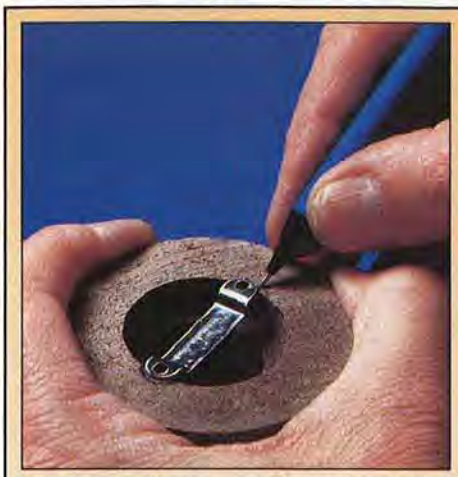
With a skew chisel or spindle gouge, cut the tenon shoulder to the line. Sand the end grain with 220- and 400-grit sandpaper.

Rechuck the top

To complete the top, construct a jam chuck to receive the 1" tenon on the bottom of the part. To do

Continued

Dining-Table Duo



Draw or scribe around the ends of the retaining strap to mark the notch locations. Lay the strap in the hole upside down as shown to make this easier.

The drive plate shown on the bottom of the top's tenon engages the square mill shaft. Align the slots on the mill housing with the notches in the turned body.

so, cut a disc of 1-2"-thick scrapwood the same size as your 3-4" lathe faceplate, and attach it to the faceplate. Mount the assembly on the lathe, and true the disc's edge and face. Scribe a centered 1" circle on the disc, and bore a hole inside the circle with a gouge. The top's bottom tenon must fit snugly into the hole.

Mount the workpiece, and part off the tenon on top. Enlarge the hole to 5/16" diameter 3/16" deep to accept the shank of the knob that screws onto the mill shaft. With the tip of a skew, form a 5/64" rabbet 1/16" deep around the hole to allow the knob to fit down into the top. (The rabbet will form a 15/32" counterbore 1/16" deep around the knob hole.)

Finish-sand the top. Finish the top to match the grinder body.

Assemble the pepper mill

Lay the retaining strap across the bottom of the body, as shown *above*. Mark around the ends of the strap where the body must be relieved for the strap to fit into the counterbore.

Form the reliefs for the strap ends with a 1/4" Forstner bit chucked in a drill press. (Or, you can carve the notches with a 1/4" no. 11 carving gouge.) Lay the strap in place, and drill 1/16" pilot holes 1/2" deep through the holes for the mounting screws.

Press the mill housing into the bottom of the body, aligning the screw slots with the reliefs in the body. Insert the shaft, with the spring in place, through the center hole from the bottom, as shown *above*. Install the retaining strap with the screws provided.

Attach the drive plate with the square hole to the bottom of the top's tenon, using the screws furnished. Then, slide the top over the shaft, and screw on the knob. In use, you can adjust the grinder's coarseness with the knob—tighten it for a finer grind, loosen it for larger chunks of fresh-ground pepper.

A shaker completes the set

Mount the 6 1/4"-long piece of stock between centers, and round it down to 2 1/2". Mark the turning 1/2" and 6" from the headstock end. Just outside each line, part in to 3/4" diameter. Form a tenon on the top—the headstock end—to fit the drill press fixture. True the bottom to the line.

Dismount the turning, and place the top tenon in the drill press fixture. Grip the blank with a handscrew clamp. Chuck a 1 3/8" Forstner bit in the drill press, and center it over the blank. Cut away the bottom tenon with the bit, and bore 1/8" deep into the blank. Change to a 1" spade bit, and bore an additional 4 1/2" into the piece.

Remount the workpiece, engaging the tail center into the hole. Form the profile, referring to the full-sized template on the *previous page*. Shape the contour as far over the top as possible. Dismount the turning.

Remount the 1 3/8"-tenon jam chuck. Cut into the face of the fixture to lengthen the tenon to 1". Then, turn it to 1" diameter to fit snugly into the shaker opening. Mount the turning on the tenon, and shape the top, as shown in the illustration *previous page*.

Refer to the Shaker Holes drawing, and lay out the pattern for the holes on top of the shaker. Drill the holes with a drill press. Sand and finish, then install the plug.

Buying Guide

Pepper mill, shaker plug. Complete pepper mill unit and rubber plug for salt shaker. Item no. WMP700, $7.95 ppd. in U.S. Craft Supplies USA, 1287 E. 1120 S., Provo, Utah 84606, or call 800/551-8876.

Project Design: Thomas Moore
Pepper mill turned by Rus Hurt
Illustrations: Roxanne LeMoine; Lorna Johnson
Photographs: Dean Tanner
Written by Larry Johnston

This Delta exclusive gives you a lock on snipe control. Patent-pending cutterhead snipe control lock stabilizes the cutterhead during operation, for complete rigidity.

Those who've had a sneak preview have nice things to say about it. Priced in the middle of the pack–we're betting it'll end up at the head of its class.

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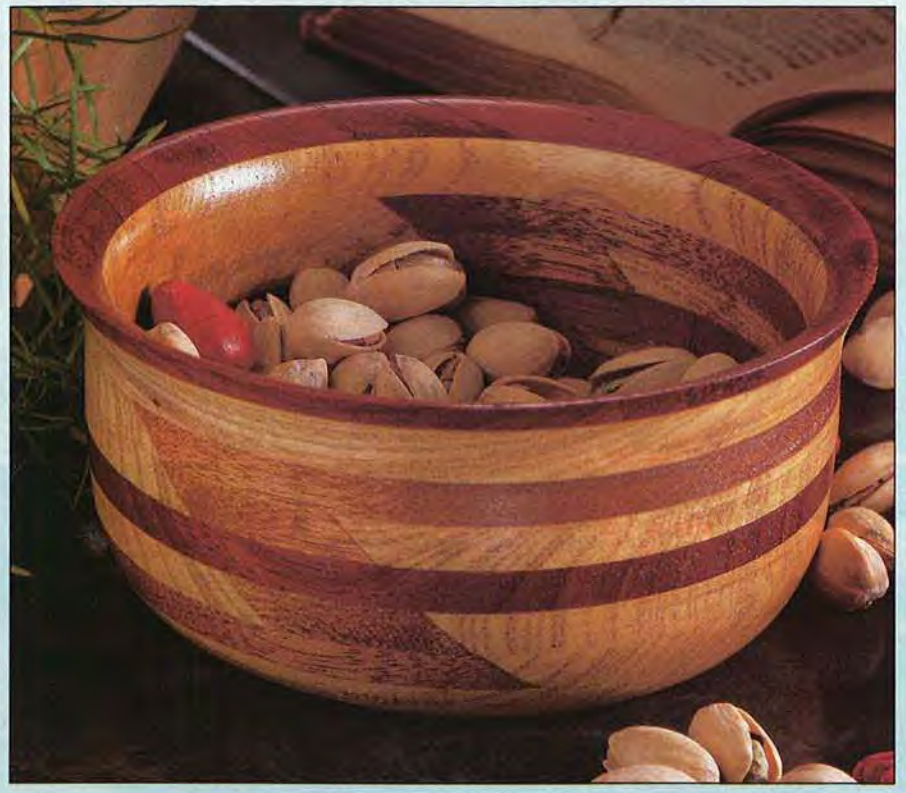
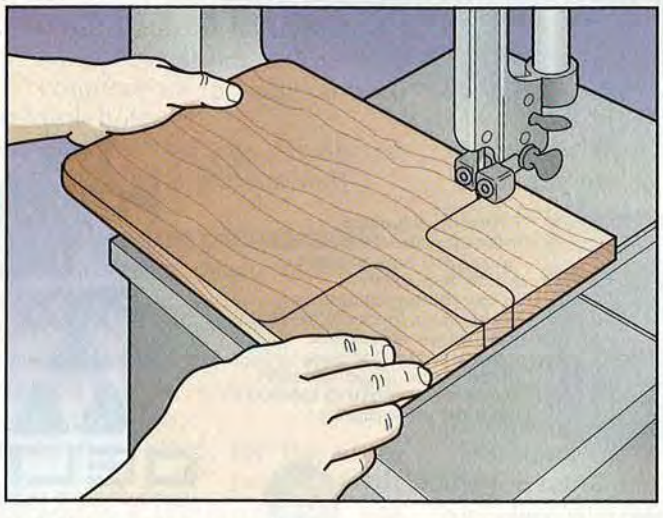
Food-Safe Finishes

Wondering what type of finish to safely use on bowls, cutting boards, or toys? Nowadays, practically any type does the job. Here, though, is the how-to lowdown on applying the clear, penetrating oil type touted as food-safe.

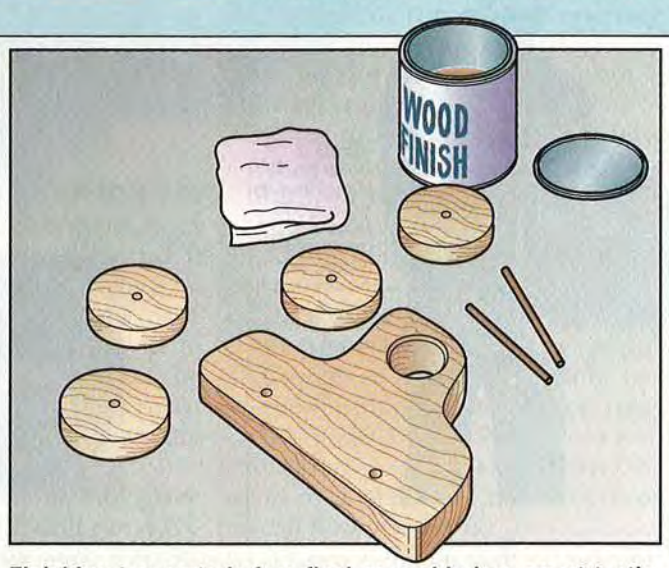


It's a frequently asked question: What wood finishes are safe for food contact and for children's toys? Unless a finish, including paint, contains lead, practically all of them prove nontoxic when completely cured. But with the heightened concern about the toxicity of wood finishes—and their airborne vapors—it's reassuring to know that there are several clear oil finishes specially formulated (and advertised) to be food-safe, with natural ingredients certified as such by the Federal Food and Drug Administration.

Behlen Salad Bowl Finish, Preserve Wood Finish, and Butcher Block Oil are three such products that spell relief for woodworkers fearful of making the wrong finishing choice. These clear finishes are proprietary (that means secret) mixtures of nut oils, natural driers, and mineral spirits. Of course, you can't drink them in liquid form, but they're completely safe after curings (72 hours, except for Preserve, which is advertised as safe immediately



Select dense, fine-grained woods such as hard maple or cherry for food-contact projects, like cutting boards. Fine grain minimizes the tiny pores that can harbor bacteria.



Finishing toy parts before final assembly is a smart tactic. Sanding is easier piece by piece, and you get a smoother, more complete finishing job.

Handling these clear oils takes some technique

after application). You'll also find available nontoxic, solvent-free stains, such as Clearwater Color Stains from Woodworker's Supply, to use under the clear oils. You can use all of these products on butcher blocks, cutting boards, utensils, toys, and other projects that come into contact with food, animals, or children.

There is, however, one drawback to these products. You probably won't find any of these finishes or stains at your local hardware store, so you'll have to order them (see the Buying Guide).

How to apply the oils

Prepare your project for stain or finish by final sanding with 220-grit paper. Make sure that the wood is clean, dry, and free of oil or grease. Remove any dust with a tack cloth or vacuum.

Wipe on the oil finish with a lint-free cloth (such as cheesecloth) or sponge in a thin, uniform coat. Wait six hours, then lightly sand the wood with 400-grit sandpaper. Remove the dust and apply a second coat. You can apply more, but you must let each coat dry for 24 hours, then rub it with 0000 steel wool. Then wait 72 hours before using your project, or as directed on the label for each product. (The illustrations on the preceding page and *below* give you more advice on making and finishing toys, cutting boards, and other projects.)

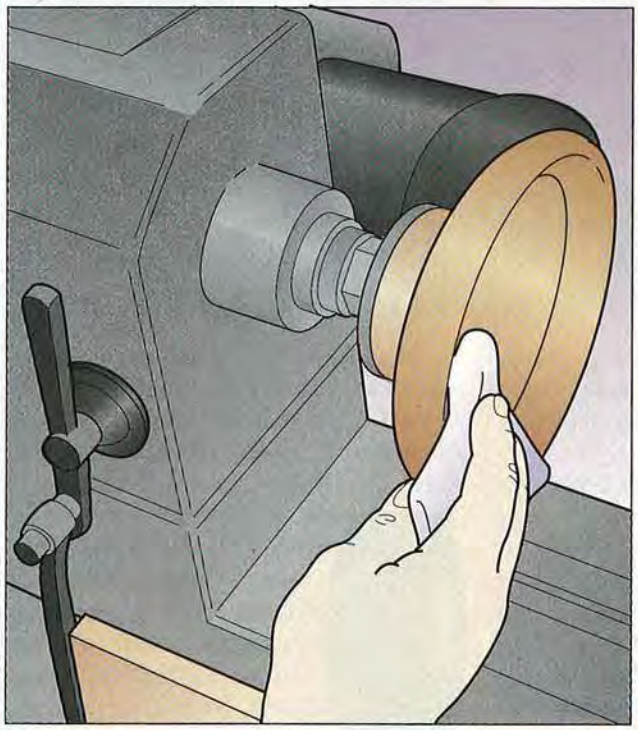
Illustrations: Carson Ode

TIPS TO REMEMBER

- Purchase only enough finish to last for 3-6 months. The material in a partially-filled container sitting on a shelf will begin to gel, and will not flow out well when applied.
- For best results, apply the finish at room temperature.
- Provide a well-ventilated dust-free area for your projects to dry after finishing.

BUYING GUIDE

Behlen Salad Bowl Finish is available at some woodworking specialty stores and from mail-order sources (call 518/843-1380 for a dealer). The Woodworkers' Store (800/279-4441) carries Butcher Block Oil. And Preserve is available from Woodworker's Supply, Inc. (800/645-9292). Check the respective catalogs for prices.



Finish turnings on your lathe, applying finish with a lint-free cloth. Use a light touch and a slow lathe speed.

Inspect your projects by holding them at a glancing angle to a light source. Apply additional finish to areas that appear dry.

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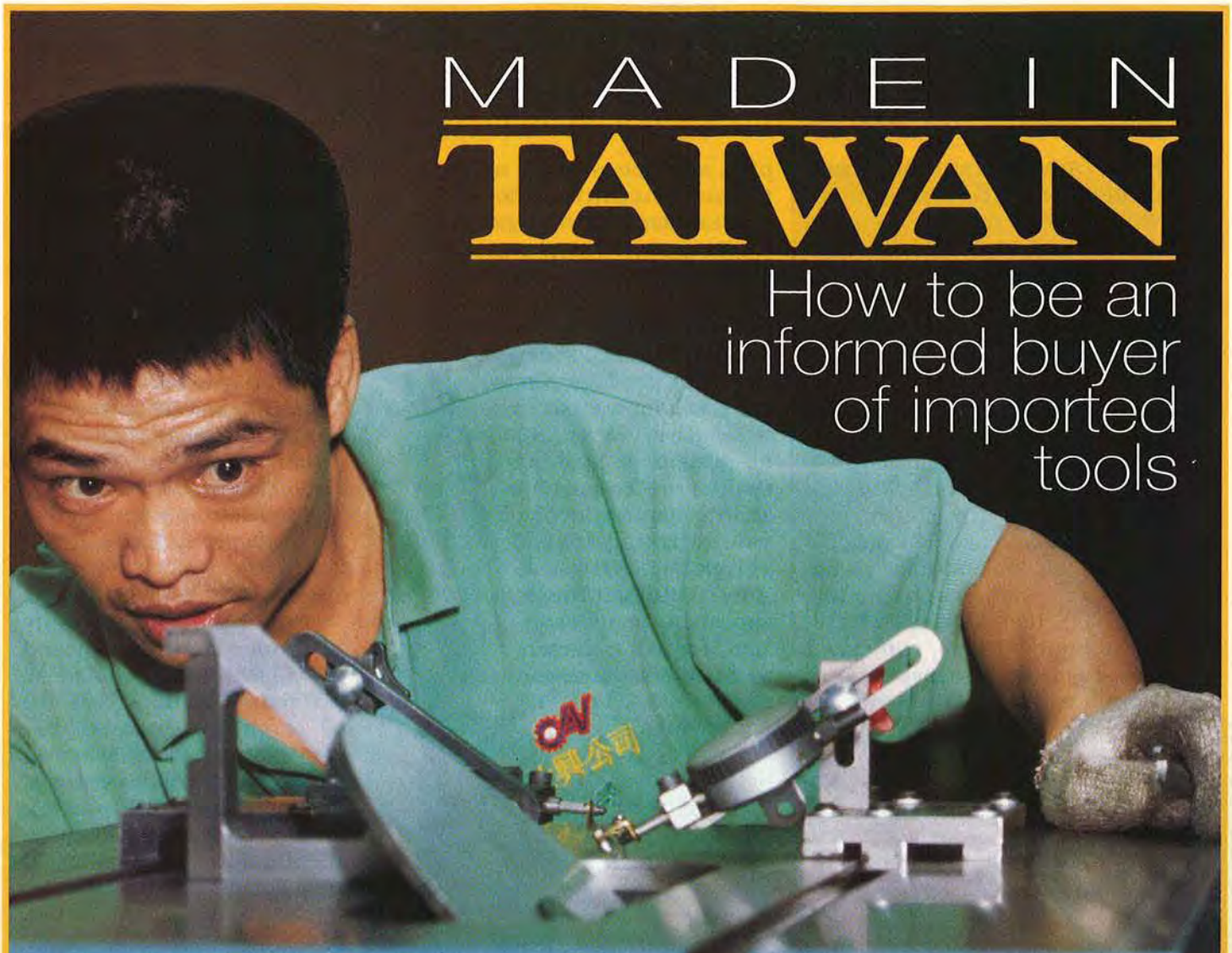
MADE IN TAIWAN

How to be an informed buyer of imported tools



This assembler at OAV, Jet's main Taiwanese supplier, checks the blade alignment of a model JWCS-10 tablesaw.

At least once a week I hear from a reader who is ready to plunk down his hard-earned cash for a Taiwanese-made woodworking machine. "The low price really tempts me," the inquiry typically goes, "but will I be happy with it? After all, you get what you pay for, right?"

In hopes of helping both myself and *WOOD*® magazine readers gain a fuller understanding of Taiwanese tools, I recently visited the country. While there I checked out 16 factories and met with the representatives of three major companies involved in Taiwan: Delta, Grizzly, and Jet. What I learned during this trip really opened my eyes (even though I've been testing and reporting on Taiwanese-made tools for 10 years). So come along as we visit the other side of the world. I promise you'll find the trip as enlightening as I did. And, you'll be a smarter shopper the next time you're in the tool market.

Bill Krier
Assistant Managing Editor

Continued

TAIWAN

How Taiwan manufacturers differ from U.S. producers

While in Taiwan I saw factories that ranged from first- to third-world in sophistication. Some were large, fairly modern plants with well-managed, efficient assembly lines. Others appeared disorganized, where workers sat on boxes, banging together tools, seemingly anywhere they could find an open spot on the floor.

Although I saw some CNC (computer numerically controlled) milling, turning, and sheet-metal-bending equipment, none of the Taiwanese plants were as modern as the U.S. tool factories I've visited. Robotic welders, automated powder-coating systems, and laser metal-cutting equipment, all found in tool factories here at home, were not evident on my Taiwan tour.

That's not to say that Taiwanese factories cannot make high-quality goods—many do. Rather, because of the low cost of labor in Taiwan, plant managers there do not have financial incentive to invest in sophisticated labor-saving devices. (At Rexon, the largest plant in Taiwan producing woodworking machinery, company officials told me employees on the factory floor average $3-$3.50 per hour, and work 44-hour weeks.)

Compared with U.S. manufacturers, little in the way of research and development for woodworking tools goes on in Taiwan. Why? Although there appears to be no shortage of good engineers there, woodworkers and a woodworking-tool marketplace do not exist, for the most part. So, a Taiwanese engineer can attempt to copy an existing U.S.- or European-designed machine, but he has little idea about the needs of woodworkers or the nuances of their craft.

Side Note: *Although I found no evidence of hobbyist or small-shop woodworking in Taiwan, I witnessed carving being performed by highly skilled local artisans. I picked up the 22"-tall, intricately carved likeness at* left *(of Da Mo, a Buddhist god, I was told) for $160 at a carving village north of Taichung.*

Unlike U.S. plants that typically produce tools only under their own brand names, most Taiwanese plants manufacture for multiple brands. For example, at the Rexon plant I saw mitersaws, tablesaws, drill presses, and scrollsaws being made for about a dozen major U.S. and Japanese brands.

Manual labor costs are much lower in Taiwan than in the U.S. Here, workers weld together bases for Grizzly cabinet saws.

Taiwan is a small (about 70×200 miles), mountainous island located about 100 miles from mainland China. With little in the way of natural resources or farmland, its 22 million inhabitants depend heavily on importing raw materials and exporting manufactured goods.

Today, Taiwanese woodworking machines account for nearly 95 percent of all of the benchtop woodworking machines sold in the U.S., and a big chunk of the mitersaw and stationary machine market, too. Nearly all of these tools are made in and around Taichung, a city that prides itself as the machine-shop capital of Taiwan. Indeed, during my visit it seemed there was a machining or manufacturing facility, many no larger than a three-car American garage, at every turn of the head.

Although there are hundreds, and perhaps thousands, of shops in the Taichung area that produce parts for woodworking machines, about 40 major facilities assemble 95 percent of the finished woodworking equipment that reaches U.S. shores.

Which companies make or import tools from Taiwan?

Today, every major U.S.-based manufacturer of power tools has at least one Taiwanese-made product. Each of the four remaining full-line producers of stationary woodworking machines in North-America—Delta, Emerson Electric (Craftsman), General, and Powermatic—have a line of tools from Taiwan. Why? Simple economics. As Mark Schiefer, Delta's director of marketing, explains it: "The fastest growth area in woodworking equipment sales is among hobbyist woodworkers. Since most hobbyists have limited budgets, manufacturers have to sell high-value, affordably priced machines if they want to participate in this growth."

That's why Delta has been manufacturing tools in Taiwan since 1985. Today, among other products, all Delta mitersaws and benchtop tools come from Taiwan. Likewise, Emerson Electric has overseen the production of many Craftsman machines in Taiwan since 1985. Powermatic began importing its Artisan line of tools in 1989. And in just the past year, the General International line has debuted in Canada.

Continued

Some parts vendors, such as this supplier of aluminum blade housings for mitersaws, use state-of-the-art automated die-cast injecting methods.

Some common myths and realities about Taiwanese tools

No area of the tool business is more rife with myths than the subject of Taiwanese manufacturing. That may happen because Taiwan is half a world away—not a place most people get to visit. No doubt some of the stereotypes about poor quality spring out of the very real fact that a good deal of Taiwanese "junk" has been sold in this country. Once burned, woodworkers don't soon forget. And they tell their friends about bad experiences. And those friends tell other friends, and pretty soon, the importers and manufacturers of quality Taiwanese equipment are fighting some powerful generalizations.

To get a sense for the types of things on woodworkers' minds, I simply clicked my computer onto *WOOD*® Online™, our woodworking discussion group on the internet. Here's a sampling of what I found during a 3-month period:

The armature assemblies of universal motors roll off Taiwanese assembly lines by the thousands every day.

• ***Myth:*** *There are only three Taiwanese factories. Factory A makes high-quality goods, factory B produces medium-quality stuff, and factory C manufactures junk.*

Fact: A company can get high-, medium-, or low-quality goods out of a single factory. It depends entirely on how much the buyer supervises the manufacturer.

As Nevin Craig, Delta's president, told me: "If you don't have your own people in Taiwan to work closely with these manufacturers, and watch them every step of the way, they will cut corners to save on costs. At Delta we control the manufacturing process from soup to nuts."

Grizzly Imports, which previously relied on its Taiwanese trading company to conduct manufacturing inspections, recently shifted to U.S.-supervision of its inspectors. "That way, our Taiwanese factories will have American input about what Americans expect in machinery, instead of relying on what Taiwanese *think* Americans expect," said Bill Crofutt, manager of quality control for Grizzly.

Every U.S.-based manufacturer and importer that I spoke with agreed that careful monitoring of the Taiwanese factory is essential. Bill Taylor, vice president of DeWalt's machinery business, said: "Many companies simply call a Taiwanese supplier and say 'Give me a planer.' That's it. And they get burned." To ensure the quality of its only product now made in Taiwan, DeWalt has one quality engineer and two inspectors devoted solely to its model DW733 12½" portable planer being made by Geetech.

• ***Myth:*** *Tool X looks just like Tool Y, so they must be the same tool in every respect.*

Fact: Identical-looking tools can (and do) come from different factories, can be built to different specifications, and one may contain parts that would not pass inspection for the other. Further, one manufacturer may take much greater care in setting up and tuning one of the tools prior to packaging. Tools that look similar in catalog photos may indeed be identical, but then again they may differ in critical areas.

For example, during a test of mini lathes for an upcoming article (December 1997, No. 101), we tested a Taiwanese mini lathe that worked well. Then, we ordered an identical-looking but less-expensive model from another supplier. This lathe, made in mainland China, had defective motor controls, a roughly machined bed, and ill-fitting tool rests. It was unusable.

• ***Myth:*** *Taiwanese tools contain low-grade iron and aluminum castings, weak and ill-fitting hardware, poor-quality bearings, and underpowered, short-lived motors.*

Fact: Taiwanese manufacturers have available to them a full gamut of materials. Which parts go into a tool depends entirely on the specifications and inspection procedures implemented by the U.S. company.

Some companies, not satisfied with the quality of induction motors in Taiwan, will specify Taiwanese machines with U.S.-made motors. This most often happens with industrial machines costing upwards of $1,000. For example, Delta adds U.S. motors to the DJ15 and DJ20 jointers when they arrive in the States. Grizzly ships U.S. motors to Taiwan for its G1023Z tablesaw.

Most Taiwanese factories build similar products, like these dust collector blowers, for multiple clients.

Some questions to ask before you buy

Ultimately, the only way to know how well a Taiwanese tool will perform is to try it yourself, ask someone who has tried it, or follow the recommendations of published tool reviews. If none of those options are available to you, ask the following questions:

• ***Are replacement parts readily available?***

A general rule of business says that a manufacturer or importer should carry an inventory of parts not exceeding a certain percentage of total sales. So, large companies are more likely to carry significant parts inventories than small companies. If you have concerns about the availability of parts, ask the manufacturer or importer about its level of parts inventory, and where the parts are stored. Also, ask about the turnaround time for key parts.

• ***Does the tool company have a strong quality-control program in place, including a U.S.-supervised staff in Taiwan?***

Delta, with a staff of 20, and Jet, with seven employees, have two of the largest staffs in Taichung. During my tours, I saw inspectors for both of these companies at work in the factories of their various suppliers. "In Taiwan, the attitude of many manufacturers is that 'Quality is the responsibility of the purchaser,' and that's very important to understand when you do business there," according to Cliff Rickmer, vice president of operations for Jet.

Here are several other companies with Taichung staffs employed by the U.S. company: Black & Decker (DeWalt), Emerson Electric (Craftsman), Grizzly, Ryobi, and S-B Power Tools (Skil, Bosch, and Dremel).

Like every batch of incoming parts, even mitersaw wrenches are inspected for size and hardness at Kosta, Delta's main partner plant.

• ***Is the owner's manual thorough and written in clear English?***

Even if you don't pay much attention to the owner's manual when you unpack a tool, this may be the single most important clue that the importer is or isn't paying attention to the tool. If you can't make heads or tails of the manual, that's because the importer is depending on the Taiwanese factory to supply it. And if the importer doesn't have control over the manual, how much control do you suppose it has over the manufacturing process for the tool?

Written and photographed by Bill Krier

FAN-TASTIC SPORTS

Super storage for your young star

This must-build project has an outstanding one-two combination: easy construction and safety. We designed a special safety latch that your child can securely lock from the outside, but easily opens from the inside—even when padlocked!

Start with the sides and legs

1 Rip and crosscut the sides (A), back (B), and the top/bottom (C) from ¾"-thick plywood (we used birch) to the sizes listed in the Bill of Materials.

2 Referring to the Exploded View drawing for reference, mark and cut the notch on the bottom end of each side (A).

3 Rip and crosscut the leg blocks (D) to size. Glue and clamp them to the inner face of the sides (A) where shown on the Exploded View drawing.

4 Glue and nail the top and bottom (C) to the back (B).

5 Lay the assembly (B, C) on its side, and apply glue to the edges that are facing up. Then, place one of the sides (A) on the assembly, and nail it in position. Use a framing square to check the assembly. Turn the assembly over, and glue and nail the other side (A) in place. Immediately remove excess glue.

Next, make the shelf, supports, and door stops

1 From ¾"-thick plywood, cut the shelf side supports (E), back support (F), and shelf (G) to size. Fill any voids in the edges of the plywood that will be exposed after assembly (we used Durham's Rock Hard Water Putty). Then, sand the parts smooth.

2 Lay the side supports (E) and the back support (F) faceup on your

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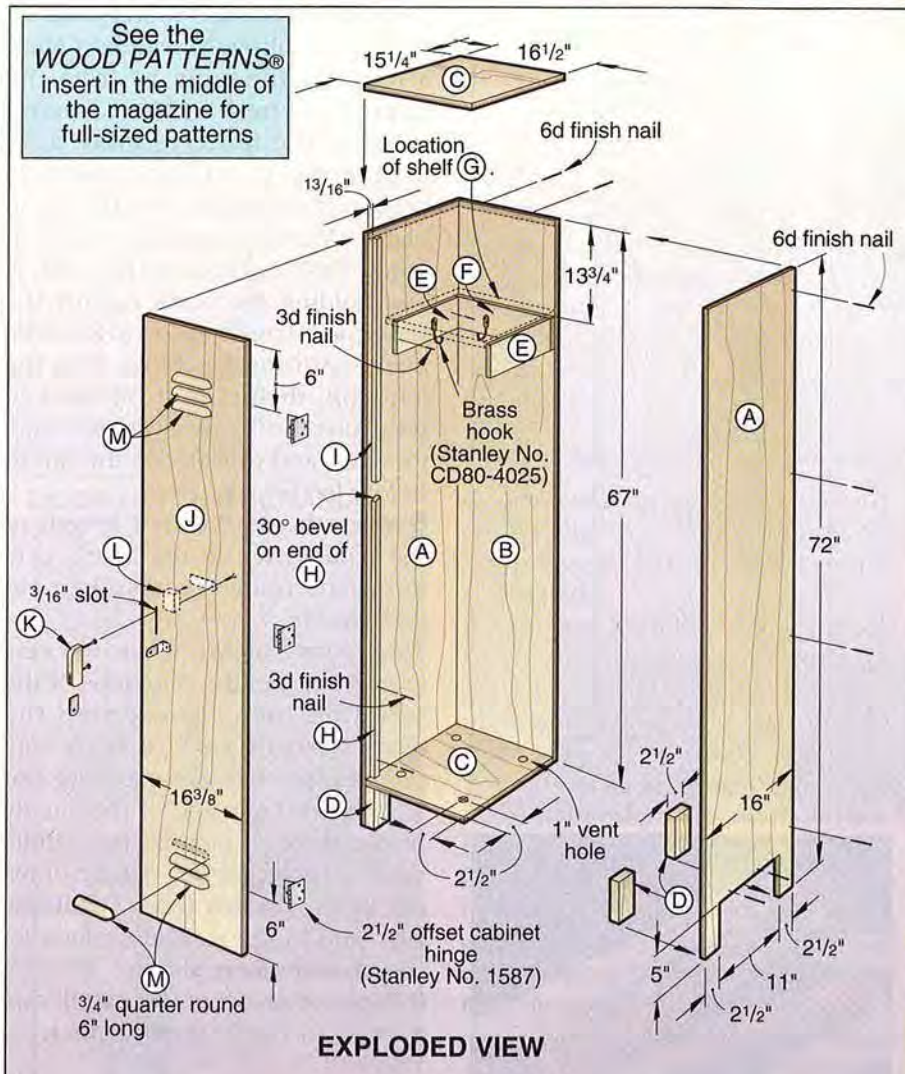
LOCKER

See the *WOOD PATTERNS®* insert in the middle of the magazine for full-sized patterns



EXPLODED VIEW

Bill of Materials

Part	Finished Size T	W	L	Matl.	Qty.
A sides	¾"	16"	72"	BP	2
B back	¾"	16½"	67"	BP	1
C top/bottom	¾"	15¼"	16½"	BP	2
D leg blocks	1½"	2½"	5"	P	4
E side supports	¾"	4"	11¼"	BP	2
F back support	¾"	4"	16½"	BP	1
G shelf	¾"	12"	16½"	BP	1
H bottom door stop	¾"	¾"	34"	B	1
I top door stop	¾"	¾"	29½"	B	1
J door	¾"	16⅜"	65⅜"	BP	1
K* handle	¾"	1¼"	4"	B	1
L latch support	¾"	1¾"	2"	B	1
M* louvers	¾"	½"	6"	B	6

*Cut parts marked with an * oversized. Trim to finished size according to the how-to instructions.

Materials Key: BP–birch plywood, P–pine or fir, B–birch

Supplies: 3–2½" offset cabinet hinges (Stanley No. 1587), 3–brass single-prong robe hooks with screws (Stanley No. CD80-4025), 3d finish nails, 6d finish nails, ⅛×1×12" aluminum bar stock, 2–#8×1¼" roundhead wood screws, 1–#8×1½" roundhead wood screw, 1–#8×2½" roundhead wood screw, 1–#6×⅝" flathead wood screws, 1–¼×1" fender washer, 1–¼" flat washer, primer, paint.

workbench, and carefully center a brass single-prong robe hook (Stanley No. CD80-4025) on each of the three supports. Mark the centerpoints of the mounting holes with an awl or pencil. Drill the holes to match the screws furnished with the brass hooks.

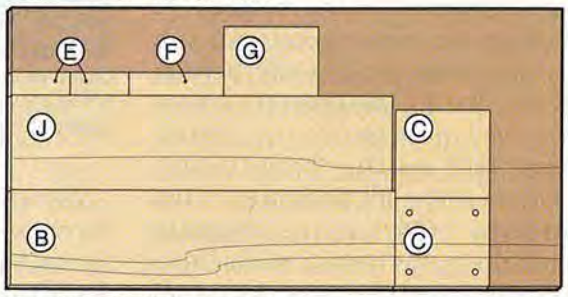
3 Glue and nail the back shelf support (F) to the back (B). Then, glue and nail the side shelf supports (E) to the sides (A) where shown on the Exploded View and Assembly View drawings. Do not attach the brass hooks now; wait until after you've painted the locker.

4 Cut the bottom and top door stops (H, I) to size, miter-cutting the top end of the bottom door stop (H) to 30°.

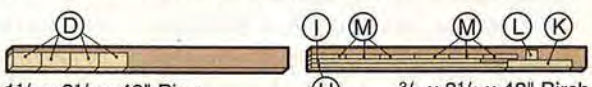
5 Temporarily nail the door stops (H, I) 13⁄16" in from the front edge of the side (A) where shown on the Exploded View and the Side Section portion of the Assembly View drawings. The gap between the two is for the latch.

Continued

CUTTING DIAGRAM

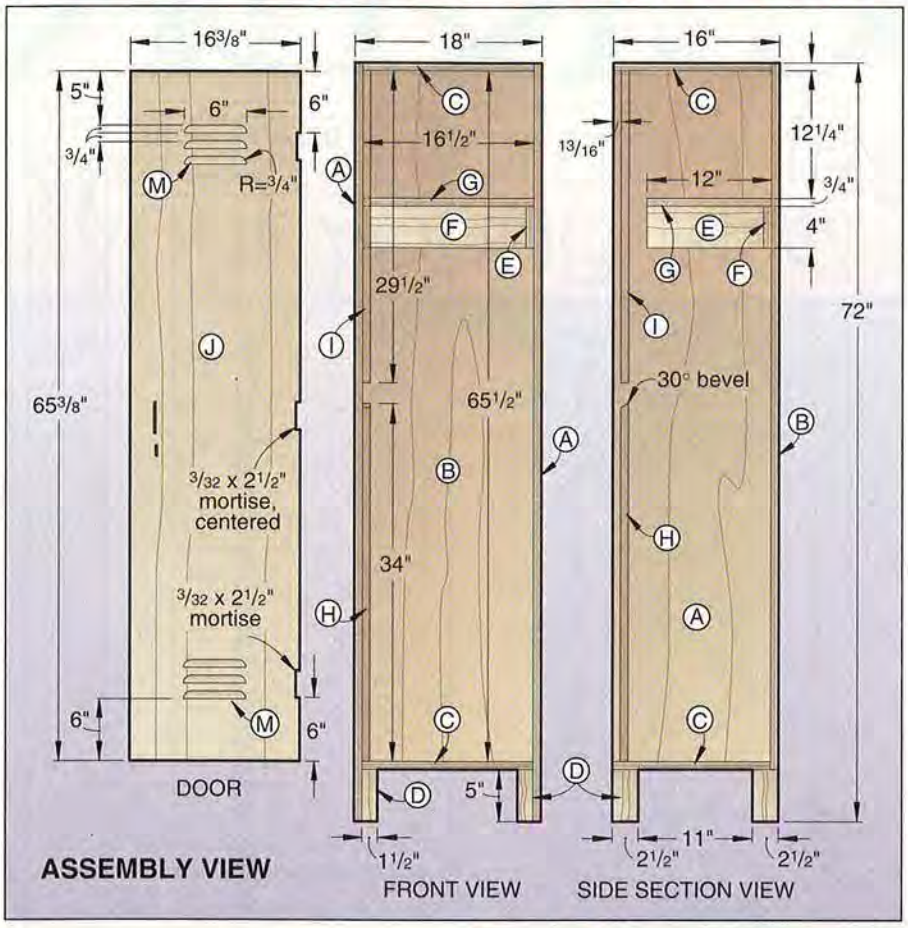


¾ x 48 x 96" Birch plywood
(Two pieces needed; use second sheet for the two As.)



1½ x 3½ x 48" Pine

¾ x 3½ x 48" Birch



Now, make the door and the wooden latch parts

1 Cut the door (J) to size from ¾"-thick plywood.

2 Mark the mortise locations on the door for the hinges (we used Stanley No. 1587, a 2½" offset cabinet hinge) where dimensioned on the Door portion of the Assembly View drawing. Cut the mortises.

3 Mark the centerpoints for the 3/16" holes for the top and bottom of the slot in the door (J) where shown on the Door Latch Template on the *WOOD PATTERNS®* insert in the center of the magazine. (Or, cut the template from the pattern pack and adhere it to the front face of the door with spray adhesive.) Then, drill the holes. Chuck a 3/16" straight bit into your router, and clamp a straightedge to the door (J) to guide the router. Then, rout the waste between the two holes to form the 3/16"-wide slot. (We routed it in three passes, lowering the bit ¼" for each pass.)

Use a pair of stops clamped to the fence when routing the 3"-long coves on both sides of the handle blank.

4 Mark the location of the ⅛"-wide slot for the lock bar on the door where shown on the template on the pattern insert. Drill a series of ⅛" holes to remove most of the waste, then finish forming the slot with a utility knife.

5 To make the handle (K), cut a handle blank measuring ¾×1¼ ×12". Chuck a ½" core-box bit into your table-mounted router, and set the bit 3/16" above the table. Clamp a fence to the table ⅝" from the center of the bit. Next, clamp stops to the fence to make a 3"-long stopped cut approximately centered along the length of the blank. (Verify your setup on scrap stock first.) Turn on the router, and holding the blank against the fence and right stop, lower the blank onto the bit. Move it to the left stop, then raise it off the cutter. Turn the blank over (not end-for-end), and repeat. See the photo *below left* for reference.

6 Mark the 4" finished length of the handle (K) on the blank, centering the routed recess, then cut it to length.

7 Set your tablesaw's fence to center a ⅛" kerf in the thickness of the handle blank. Then, clamp the blank to scrap stock to safely support the piece while cutting a slot 1" deep into one end of the handle blank. Mark ½" radii on the handle where shown on the Handle drawing in the pattern insert. Bandsaw and sand to shape. Then, rout a ⅛" round-over where shown.

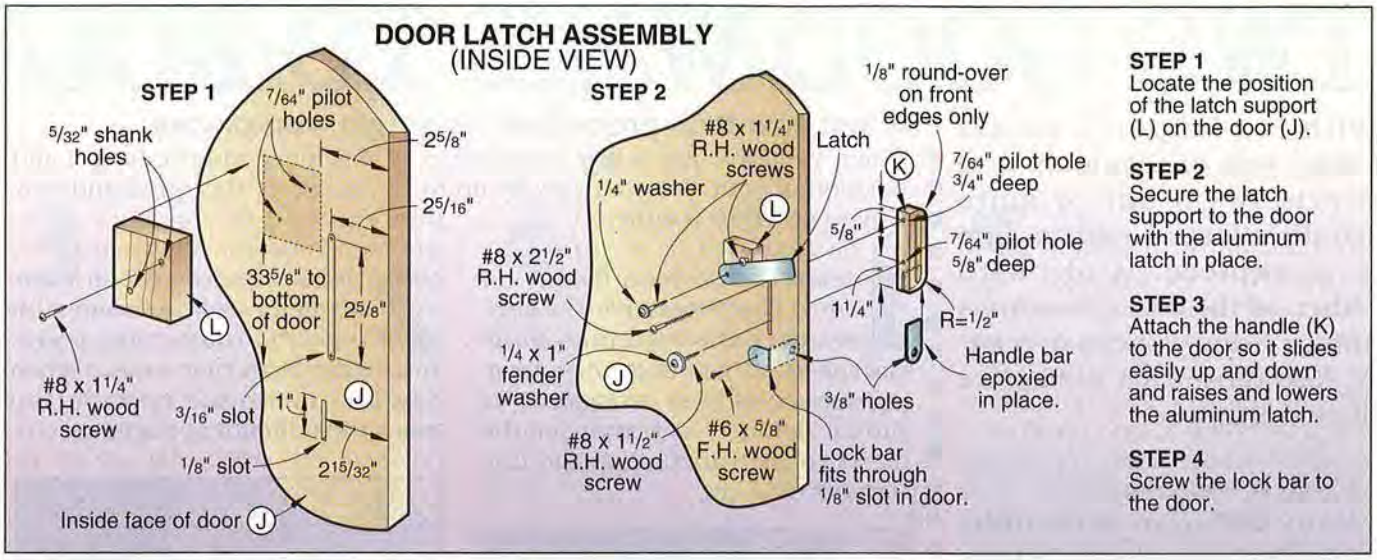
8 Rip and crosscut the latch support (L) to 1¾×2" from ¾" birch.

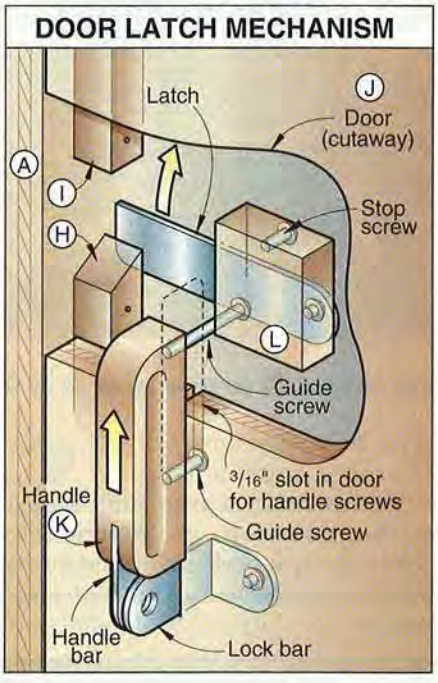
Simulated louvers are a decorative touch

1 To make the louvers (M), start with a birch blank ¾×2×25". Rout ½" round-overs along all edges of the blank. Rip a ½"-thick strip from each routed edge.

2 Crosscut six 6"-long louvers from the strips. Mark a ¾" radius at each end on the back side of one louver. Bandsaw just to the waste side of the line, then disc-sand to the line. Use this completed louver (M) as a template to mark the other blanks, then cut and sand each one to shape.

3 Referring to the dimensions on the Door portion of the Assembly


DOOR LATCH ASSEMBLY
(INSIDE VIEW)
STEP 1
7/64" pilot holes
5/32" shank holes
2 5/8"
2 5/16"
33 5/8" to bottom of door
2 5/8"
#8 x 1 1/4" R.H. wood screw
3/16" slot
1"
1/8" slot
2 15/32"
Inside face of door
STEP 2
#8 x 1 1/4" R.H. wood screws
1/4" washer
#8 x 2 1/2" R.H. wood screw
1/4 x 1" fender washer
#8 x 1 1/2" R.H. wood screw
#6 x 5/8" F.H. wood screw
Lock bar fits through 1/8" slot in door.
1/8" round-over on front edges only
Latch
7/64" pilot hole 3/4" deep
5/8"
7/64" pilot hole 5/8" deep
1 1/4"
R=1/2"
Handle bar epoxied in place.
3/8" holes
STEP 1
Locate the position of the latch support (L) on the door (J).
STEP 2
Secure the latch support to the door with the aluminum latch in place.
STEP 3
Attach the handle (K) to the door so it slides easily up and down and raises and lowers the aluminum latch.
STEP 4
Screw the lock bar to the door.



View drawing, glue the louvers (M) in place, and weight them down until the glue dries.

4 Screw the hinges into their mortises in the door (J), then attach the hinges to the side (A).

A bit of metalworking, then add the finish

1 Make photocopies of the patterns for the aluminum handle bar, latch, and lock bar shown on the *WOOD PATTERNS®* insert. Adhere the paper patterns to ⅛×1" aluminum stock (we purchased ours at a local hardware store) with spray adhesive. Center-punch all hole centerpoints, then drill to the size stated.

2 Cut the three aluminum pieces to shape. (We used a bandsaw with a ¼" blade with 14 teeth per inch, but a hacksaw also would work.) Finish forming the radii with a file or on a stationary disc sander. Remove all burrs with a file or sandpaper.

3 To bend the aluminum lock bar, clamp the end with the ⅜" hole into a metalworking vise. Position the bending line on the pattern flush with the top of the vise jaw. Use a hammer and block of wood as shown in the photo *above right* to bend the piece. Remove the paper patterns from the pieces.

4 Epoxy the aluminum handle bar into the slot in the handle (K).

5 Assemble the door latch components, following the sequence in the Door Latch Assembly and Door Latch Mechanism drawings. Screw the latch support (L) to the back side of the door.

6 Fill all nail holes and any voids in the plywood edges, and sand smooth. Mask the aluminum latch pieces, and paint the locker, door, and handle as desired. (We used a gloss enamel.) Attach the coat hooks to the inside of the locker. Remove the masking tape from the latch pieces. Using the hinges, screw the door in place.

Use a scrapwood block to aim the force of hammer blows at the bending line.

7 Slide the screws through the 3/16" slot in the door and into the back side of the handle (K) where shown on the Door Latch Assembly drawing. Drive the screws, but do not overtighten them. The handle must be free to slide up and down. In the down position the ⅜" hole in the aluminum handle bar must align with the ⅜" hole in the lock bar. Move the handle up, and the 2½" roundhead wood screw in the handle should lift the aluminum latch, allowing the door to open. The latch slides along the back edge of the bottom door stop (H). You may need to adjust the height of the door stop (H). Once properly located, glue and nail it in place.

Written by Robert J. Settich Project Design: James R. Downing Illustrations: Roxanne LeMoine Photographs: Bill Hopkins; John Hetherington

TWO GOOD WAYS TO ROUT

With the help of a router table, you can quickly and precisely cut one or more parallel slots or rabbets into a workpiece. And, with either of the two procedures shown here, you can precisely stop those cuts workpiece after workpiece.

First, a few basics

Many different router-bit profiles work well for making stopped cuts. Just a few of them: V-groove bits for one or more parallel veins, round-nose or "core-box" bits for cutting flutes, and dovetail bits for sliding-dovetail joints.

Most of the time, though, you'll use a straight or spiral bit to make square-walled cuts with flat bottoms. Depending on the application, you might be cutting a groove, rabbet, or mortise. For simplicity's sake, we'll refer to all of these cuts as "slots."

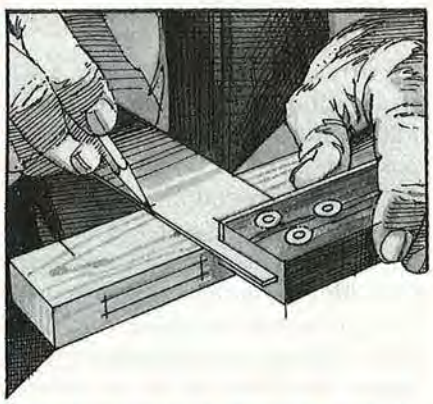
For both of the procedures described here, you need to start by doing two things. First, adjust the height of the router-table bit for the necessary cutting depth. (For deep mortises you may need to set the bit at a low starting height and make the cut in a series of passes.) Then, depending on where you want the cut to fall on the width of the workpiece, set the fence the necessary distance from the bit.

Print this article

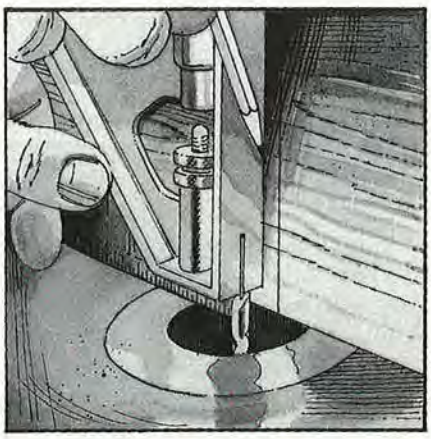
A fast, low-tech procedure for single workpieces

When you have just a few workpieces to machine, and the length and position of your slots can vary by up to 1/16" or so, try this quick-and-easy way to get the job done.

1 Mark the position of the cut onto the workpiece. Then, transfer the location of the end marks of the cut to the adjoining surface of your workpiece as shown *below*. Next, transfer the marks to the surface opposite the surface to be cut.



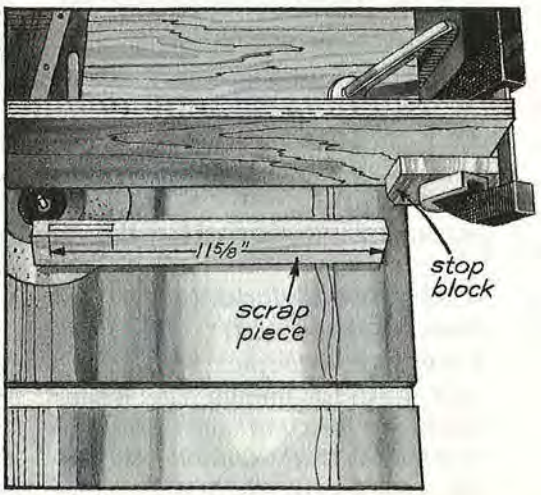
2 Use a square to mark the diameter of your router bit onto the router-table fence. Rotate the router bit so that when you butt the square up to it, you mark the full cutting diameter.



How to get on-the-money results with multiple pieces

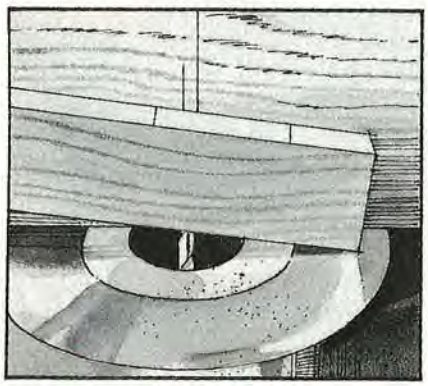
For fast and extremely accurate results with multiple workpieces, take a few minutes to position and clamp two stopblocks to the router-table fence. You can make the stopblocks from scrapwood. Just be sure to notch one corner. This provides a place for sawdust to go so that your workpieces firmly contact the stopblock.

1 On a piece of scrap the same length as your workpiece, mark the position of the slot. Now, measure from the left end of the slot to the right end of the scrap. Use this measurement to locate a stopblock on the fence, measuring to the right from the left edge of the router bit. For example, the left end of the mortise shown at right is 11⅝" from the right end of the scrap. So, we clamped the stopblock 11⅝" from the left edge of the router bit.

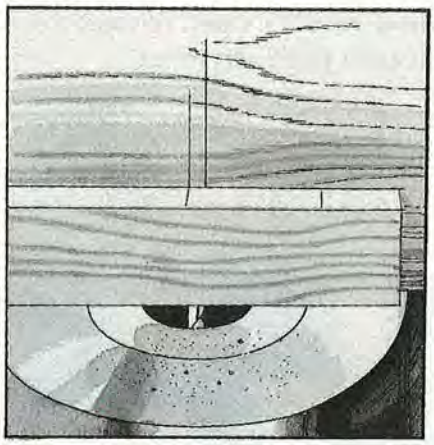


STOPPED CUTS

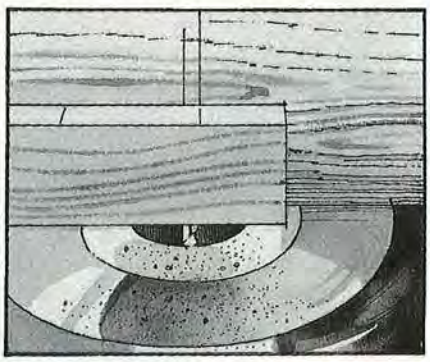
3 Turn on the router and place the workpiece against the fence, with its left end suspended and its right end resting on the router table. Now, slowly lower the workpiece completely onto the router bit, with the workpiece's left mark about ½" to the left of the left mark on the fence as shown *below.*



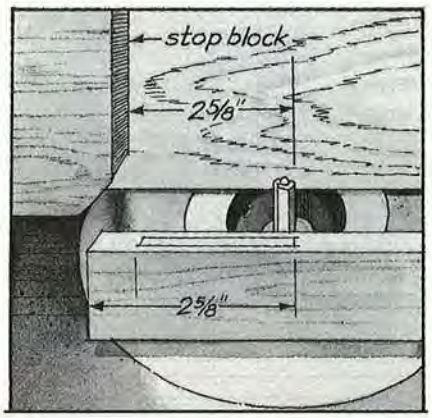
4 Carefully slide the workpiece to the right so the left mark on the workpiece and left mark on the fence align. This short, so-called "climb cut" goes opposite of typical feed direction, so go slow for safety *and* accuracy.



5 Now, slide the workpiece from right to left until the right marks on the workpiece and fence align. Then, slide the workpiece about ½" to the right and lift the workpiece straight up, being careful to keep it in firm contact with the fence. On slots more than 1" deep, switch off the router before removing the workpiece.

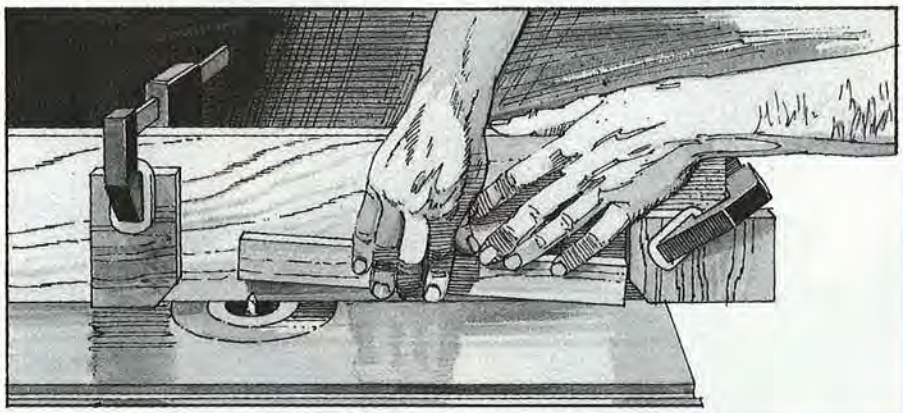


2 On the same piece of scrap wood, measure from the right end of the mortise to the left end of the scrap (2⅝" in the example *below*). Use this measurement to position and clamp the left-side stopblock. As shown, we set the left-side stopblock exactly 2⅝" from the right edge of the router bit.



3 Start the router and place the scrap piece against the right-side stopblock as shown *below*, and lower the piece onto the bit. Slide the piece to the left until it contacts the left-side block, then slide it back and forth to ensure a complete cut. Lift it straight up and measure the position of the slot. Adjust the the stopblocks as necessary before cutting your workpieces.

You may find that some workpieces are too long to rout using your current router-table fence. In that case, either make a longer fence, or attach stopblocks to the workpiece and cut the slots with a handheld router outfitted with an edge guide.



Written by Bill Krier with Jan Svec Illustrations: Jim Stevenson

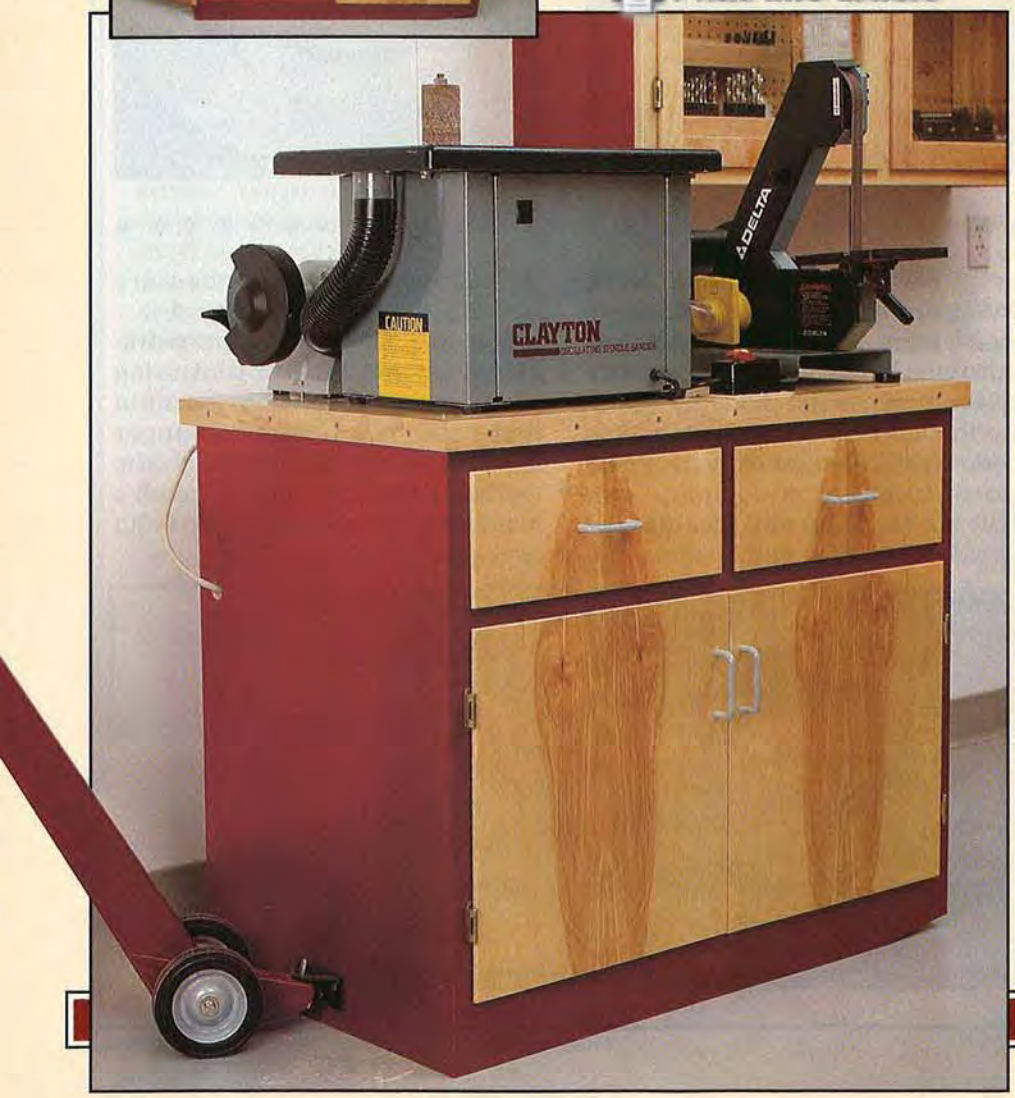
MOBILE SANDING

Believe it or not, we designed this space-saving project almost 3 years ago for Idea Shop 2. But, in the rush to get everything done, we forgot to schedule it into an issue. Better late than never, though, right? Actually, the project has gotten better since we brought it into the *WOOD*® magazine shop. Project builder Chuck Hedlund has figured out a way to connect all three sanding machines via clear plastic blast gates to a shop vac. It's hard to find dust around here anymore.

Larry Clayton

Larry Clayton, Editor

Print this article

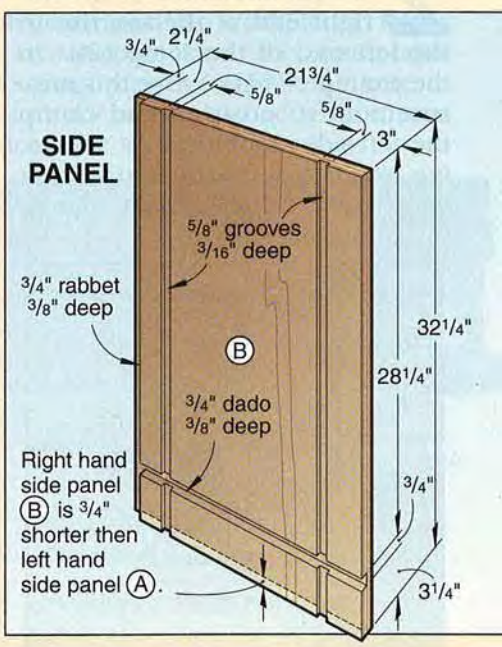


Note: See the January 1995 issue (#76) for building the two-wheeled mover shown below left. Or, for a photocopy of the article, send $3 and a self-addressed stamped envelope with $.32 postage to WOOD Magazine's Tool Mover, 1912 Grand Avenue, Des Moines, IA 50309-3379.

Start with the plywood carcase

1 Cut the left-hand side panel (A) and right-hand side panel (B) to the sizes listed in the Bill of Materials from ¾" birch plywood. Note that side B is ¾" shorter than side A to allow for clearance when using the tool mover to move the cabinet.

2 Cut the bottom panel (C) and back panel (D) to size. Cut a ¾×6" taper at the bottom right-hand corner of the back panel to match the one you will cut in the face frame later. (See the Face Frame drawing for reference. When assembling the cabinet later, the



CENTER

tapers must be directly across from each other. The tapers allow the casters to come in contact with the floor without the corners of the back panel and face frame rubbing against the floor when moving the cabinet.)

3 Mark the location of the rabbets, grooves, and dadoes on the inside face of the plywood side panels (A, B). Cut or rout them to the sizes listed on the Side Panel drawing. (We fitted our tablesaw with a dado blade and wooden auxiliary rip fence. Then, we test-cut scrap pieces of plywood first to verify a snug fit of the mating plywood pieces and the shelf standards in their respective rabbets, dadoes, and grooves.)

4 Cut the cleats (E) and supports (F) to size.

5 Dry-clamp the carcase (A–F) in the configuration shown on the Exploded View drawing. Don't worry about the two center supports (F). You'll add them later. Adjust the size of any piece now for a square assembly.

6 Glue and clamp the plywood panels, cleats, and supports together, and check for square. Mount the side supports (F) so they position the cleats (E) flush with the top edges of the plywood panels. See the Screw-Hole detail accompanying the Exploded View drawing for reference.

The face frame comes next

1 Cut the face frame rails (G, H) to size. Now, cut the stiles (I) and mullion (J) to size.

2 Dry-clamp the face frame together, and check its fit against the front of the carcase. The outside edges of the face frame should be flush with (or even extend a fraction past) the outside surfaces of the side panels (A, B).

3 With the face frame still clamped together, use the Face Frame drawing for reference, and mark dowel-hole alignment marks on the face frame.

4 Remove the clamps, and use a doweling jig to drill ⅜" holes where marked. Glue, dowel, and clamp the frame together, checking for square and flatness.

5 Mark and cut the tapered bottom corner on the face frame.

6 Clamp the face frame to the front of the carcase. Glue and clamp the two remaining supports (F) face-to-face with the edges and ends flush. Later, drill mounting holes through the top of the cleats and through the back side of the back panel (D) to secure the 1½"-thick center support in place. Be careful to center it from side to side so identically sized drawers will fit in the openings later.

The laminated and banded top comes next

1 Cut the top pieces (K) to size plus 1" in length and width. Glue and clamp the pieces face-to-face to form the 1½"-thick top. Later, trim the laminated top to finished size (22½× 40½").

2 Rip and miter-cut the banding pieces (L, M) to size. Drill evenly spaced mounting holes where

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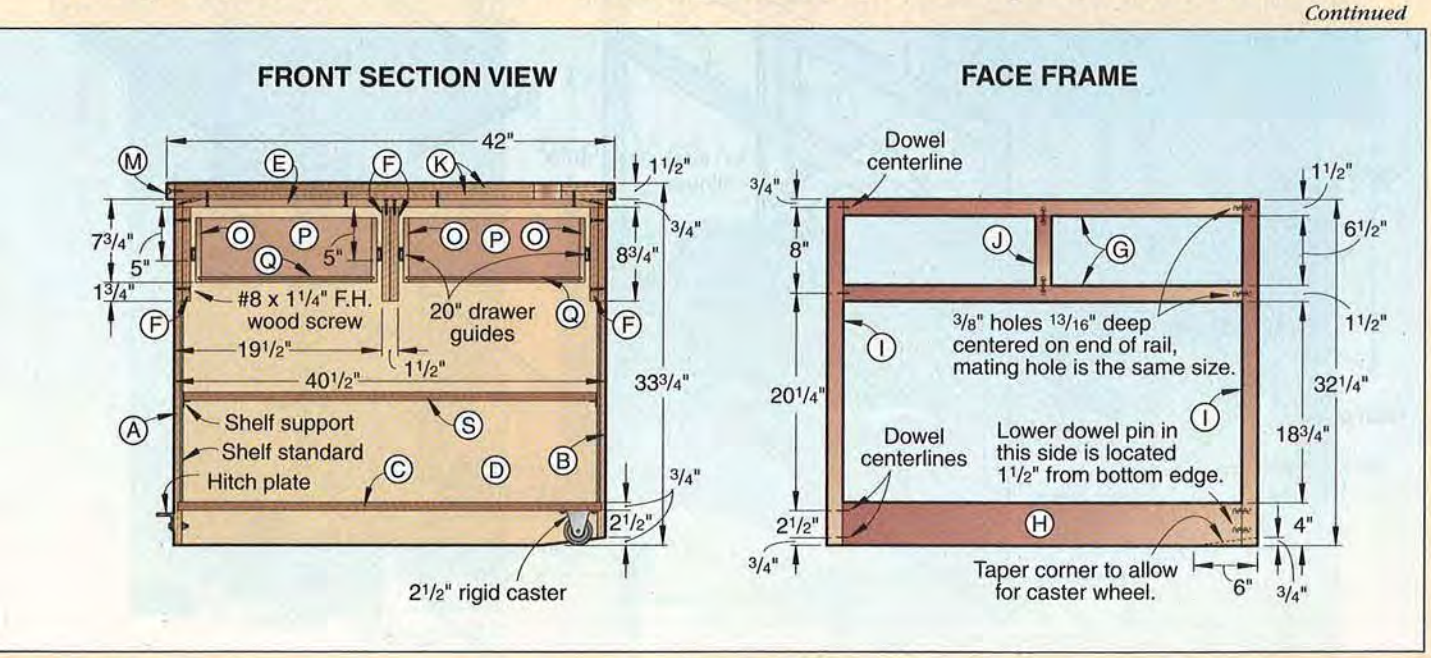
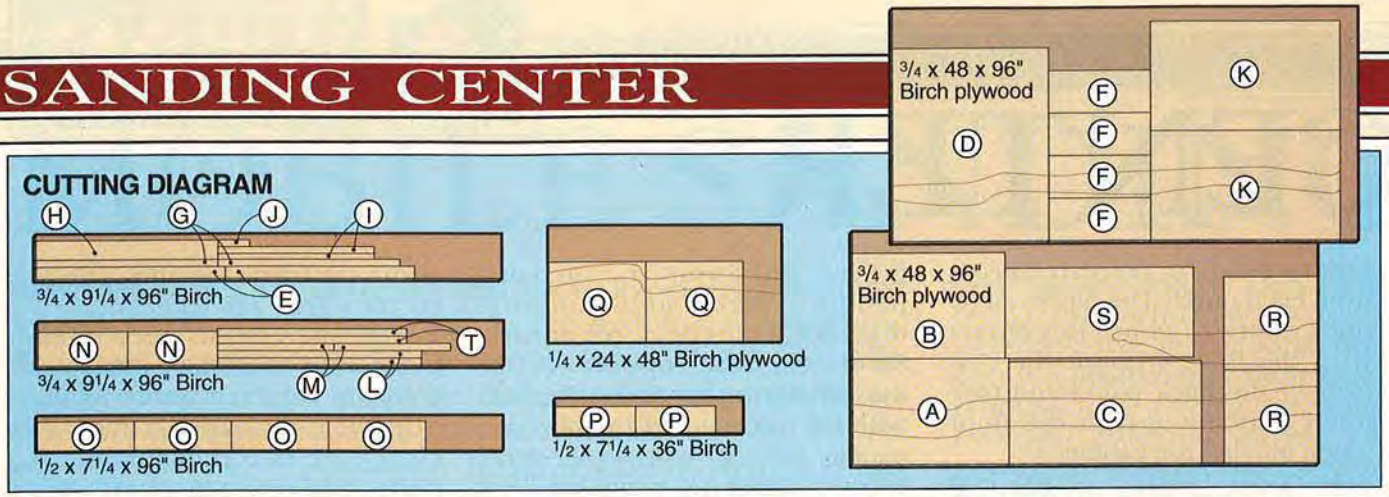
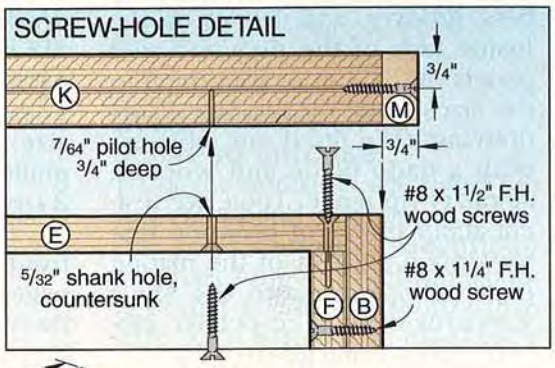
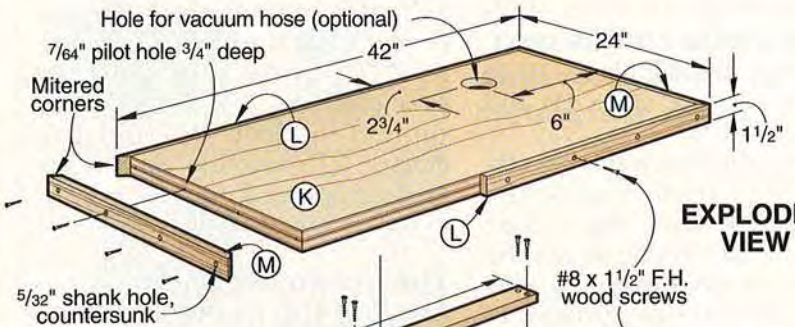
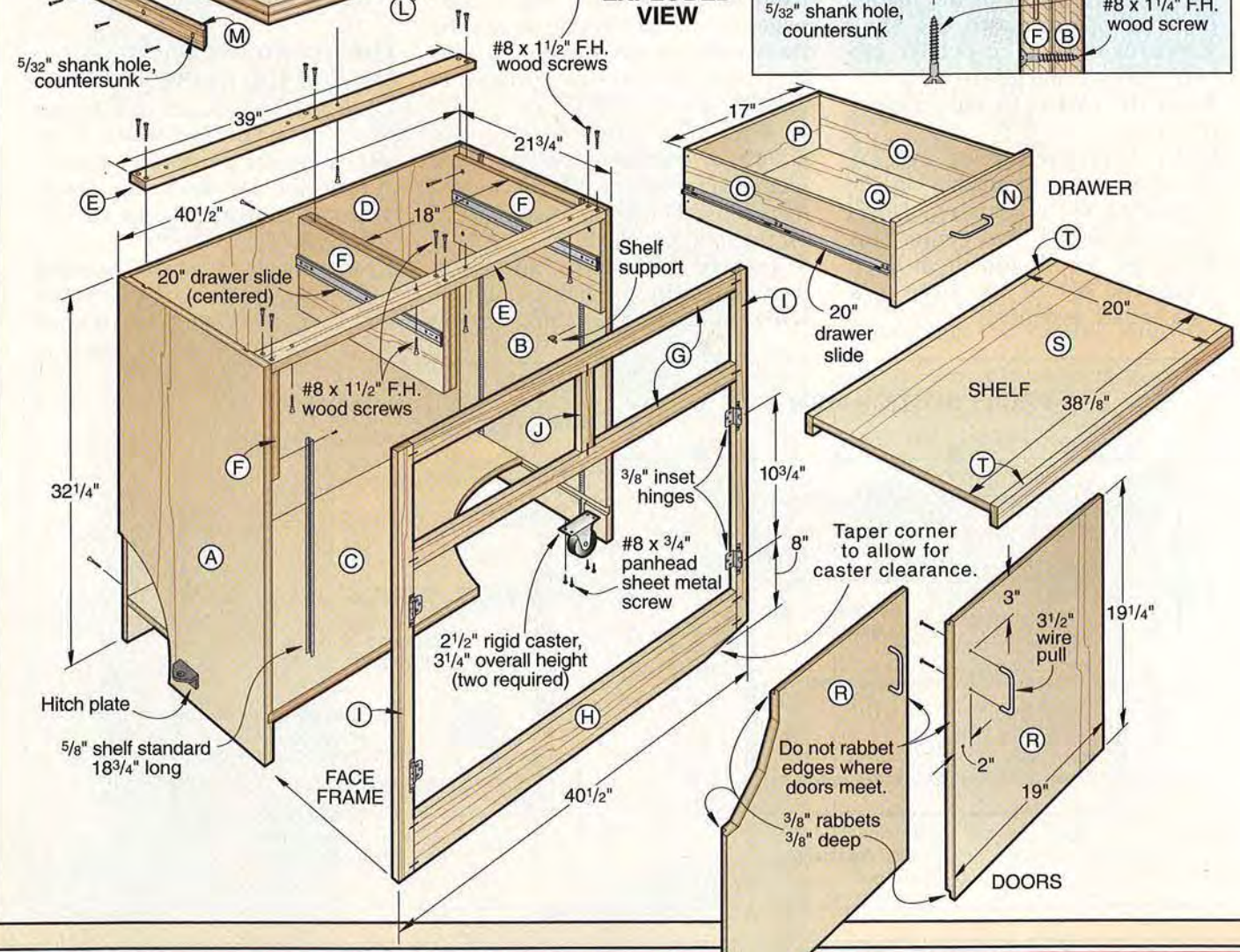


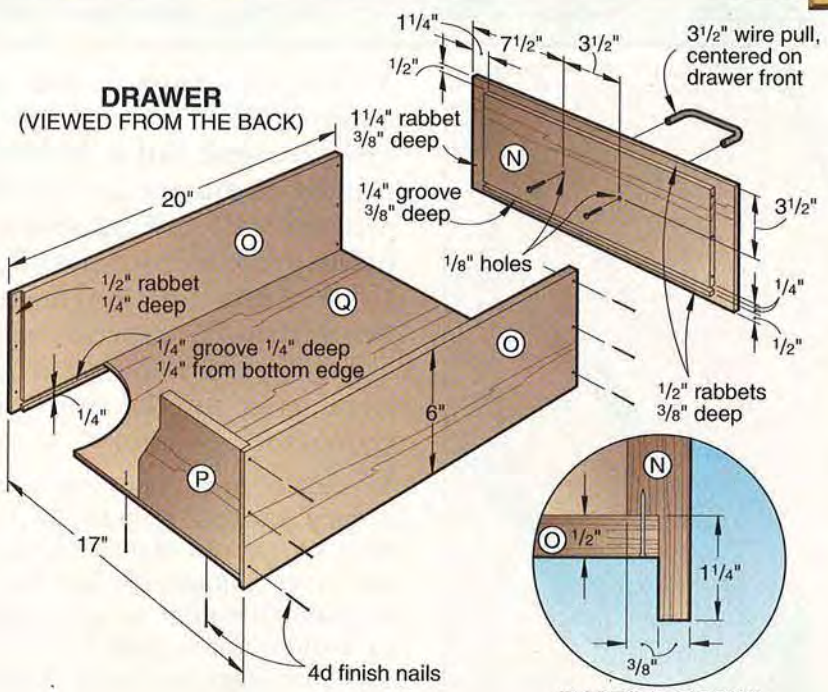






EXPLODED VIEW





RABBET DETAIL
(TOP VIEW)

Bill of Materials

Part	Finished Size T	W	L	Matl.	Qty.
CARCASE ASSEMBLY					
A L.H. side panel	¾"	21¾"	32¼"	BP	1
B R.H. side panel	¾"	21¾"	31½"	BP	1
C bottom	¾"	21"	39¾"	BP	1
D back	¾"	39¾"	32¼"	BP	1
E cleats	¾"	2½"	39"	B	2
F supports	¾"	8¾"	21"	BP	4
FACE FRAME					
G top rails	¾"	1½"	37½"	B	2
H btm. rail	¾"	4"	37½"	B	1
I stiles	¾"	1½"	32¼"	B	2
J mullion	¾"	1½"	6½"	B	1
TOP					
K* top	¾"	22½"	40½"	BP	2
L banding	¾"	1½"	42"	B	2
M banding	¾"	1½"	24"	B	2
DRAWER					
N fronts	¾"	7"	18½"	B	2
O sides	½"	6"	20"	B	4
P backs	½"	5½"	16½"	B	2
Q bottoms	¼"	16½"	20"	BP	2
DOORS AND SHELF					
R doors	¾"	19"	19¼"	BP	2
S shelf	¾"	18½"	38⅞"	BP	1
T banding	¾"	1½"	38⅞"	B	2

*Initially cut parts oversized. Then, trim each to finished size according to the how-to instructions.

Materials Key: BP–birch plywood, B–birch

Supplies: #8×1¼" flathead wood screws, #8×1½" flathead wood screws, 4d finish nails, 2–2½" rigid casters (3¼" overall height) with 8–#8×¾" panhead sheet metal screws, 10–⅜×1½" dowel pins, 2 pair of 20" drawer slides, 2 pair of ⅜" self-closing inset hinges with mounting screws, 4–⅝" shelf standards 18¾" long, 4–3½" wire pulls, clear finish, paint.

Buying Guide

Vacuum and dust-collection system. Craftsman portable wet/dry vacuum, part no. 17758, and a Craftsman whole-shop sawdust collection system, catalog no. 29964. Available from your local Sears store.

shown on the Screw-Hole detail accompanying the Exploded View drawing, and screw the banding pieces in place.

3 If you plan to use a vacuum inside your cabinet like we did, place your benchtop tools on the top and locate an open area between the tools and near the back edge of the cabinet for the vacuum-hose opening. Keep the hole as close as possible to the back edge to allow for a deep drawer. Then, drill a blade start hole, and use a jigsaw to cut a hole in the top (K) for your vacuum hose to fit through.

A pair of drawers for plenty of pull-out storage

Note: *To accommodate the drawer slide hardware, the drawers need to be 1" narrower than the openings. Our openings measure 18", and our drawers measure 17" wide. If your openings are different, adjust the drawer width accordingly. If you plan on placing a vacuum in the cabinet, you'll need to make one drawer 5" shorter than the other to allow room to run the vacuum hose through the laminated top (K).*

1 From ¾"-thick solid birch, cut the drawer fronts (N) to size. Cut or rout the rabbets and groove along the back side of each drawer front to the sizes shown on the Drawer drawing.

2 Drill mounting holes through each drawer front for adding the pulls. (We used 3½" wire pulls.)

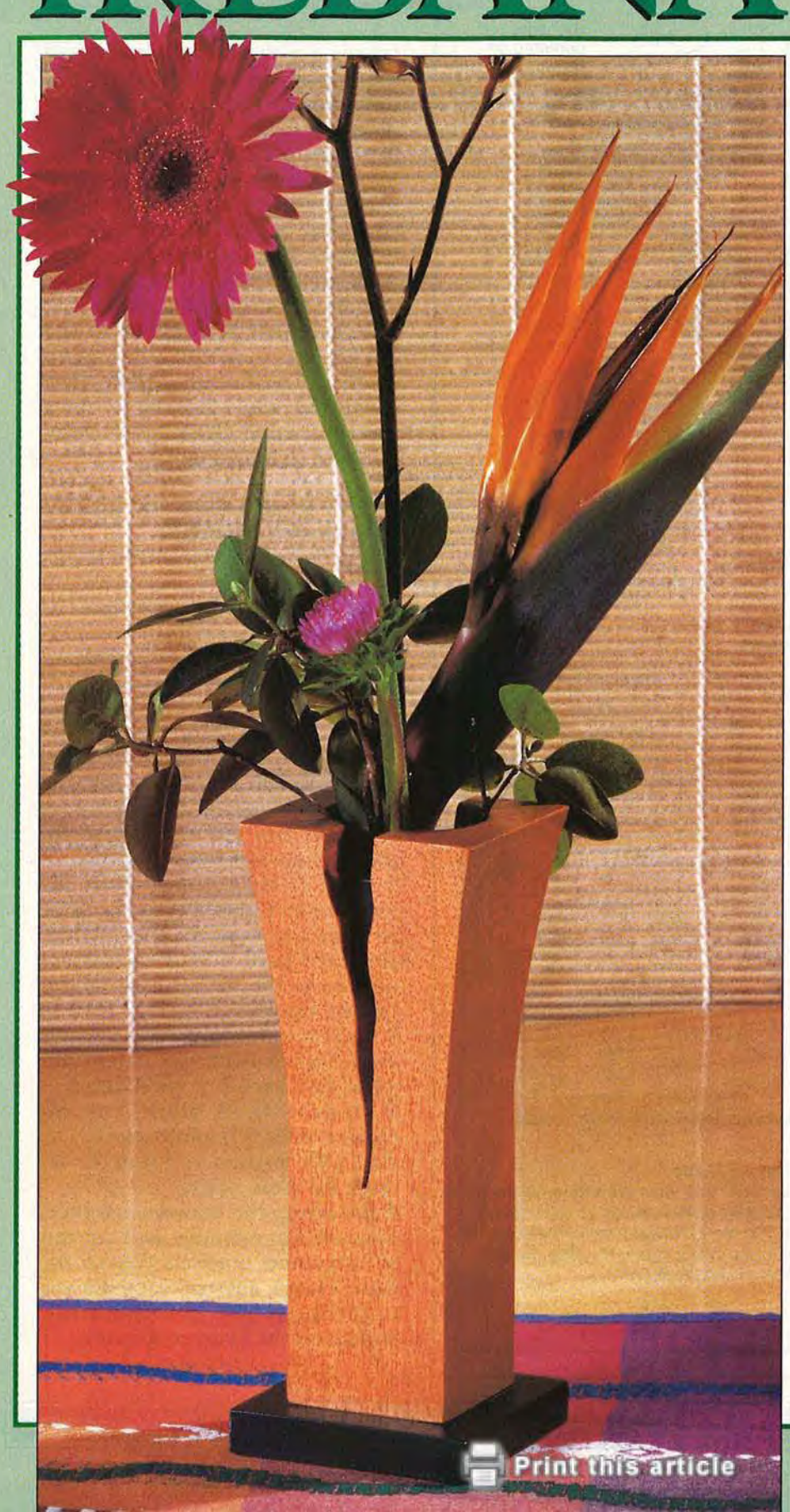
3 From ½"-thick birch, cut the drawer sides (O) and backs (P) to size. (We planed ¾" stock to ½" thick for these parts.)

4 Dry-clamp the drawers together, measure the opening, and cut the ¼" plywood bottoms (Q) to fit. Glue, clamp, and nail each drawer together in the configuration shown on the Drawer drawing.

Continued on page 106

Bandsaw a floral wonder

IKEBANA VASE



A simple expression of nature's beauty and balance. The Japanese call it ikebana, the art of flower arranging. And we call this simple-to-build project from designer John Seitz of Harmony, Pennsylvania, impressive, to say the least. It's a great gift item, even for the most discriminating person.

1 You'll need to start with a 3×3" turning square 7" long for the vase body (A). If you don't have stock this size, laminate thinner stock, matching the edge grain carefully to avoid obvious glue lines. (We used mahogany for the vase body.) Crosscut both ends square.

2 Mark diagonals on the top end of the body to find center. Then, holding the 3"-square vase body stable in a large handscrew clamp, use a Forstner bit to drill a 1⅞" hole 1⅞" deep, centered in its top.

3 Make two photocopies of the full-sized body (A) pattern at *right*.

4 Cut the patterns to shape; use spray adhesive to adhere the full-sized photocopied patterns to *adjacent* surfaces of the body (A). Bandsaw the sinuous V-shaped notch in the center of the body to shape, *on the face-grain side only*. This is especially important if you laminated thinner stock to form the body. You don't want the glue lines (or edge grain if you used a turning square) facing forward.

5 Follow the outside cutlines to bandsaw the sides of the front face to shape.

6 Use double-faced tape to adhere the pieces of waste with the paper pattern applied to it back to the side of the body. Now, as shown in the photo at *right*, bandsaw the outside lines on this pattern to cut the front and back to shape.

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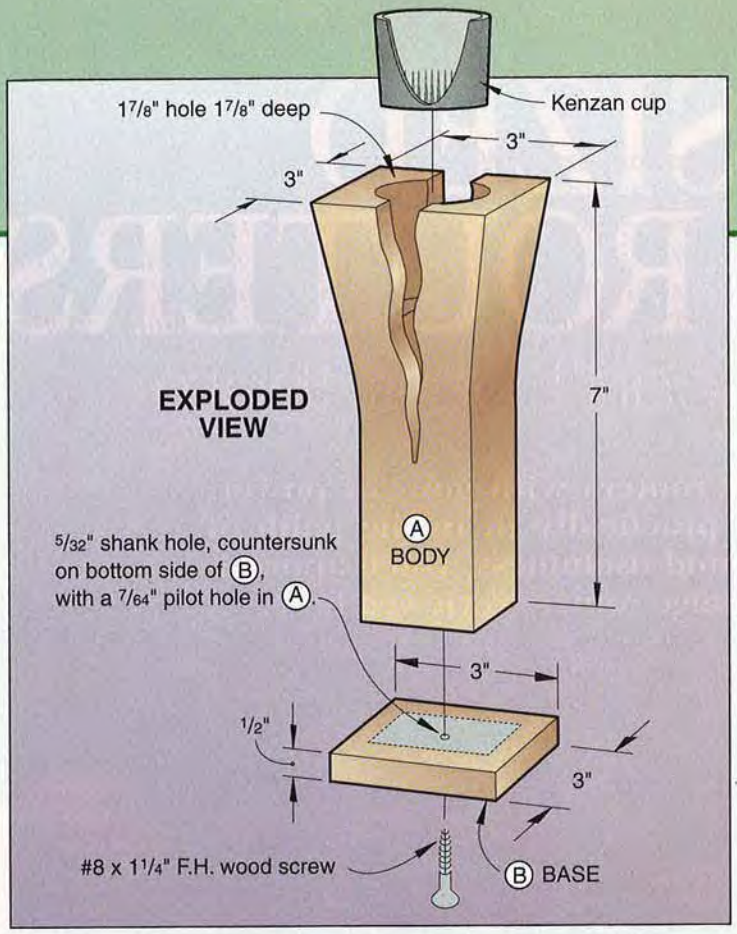
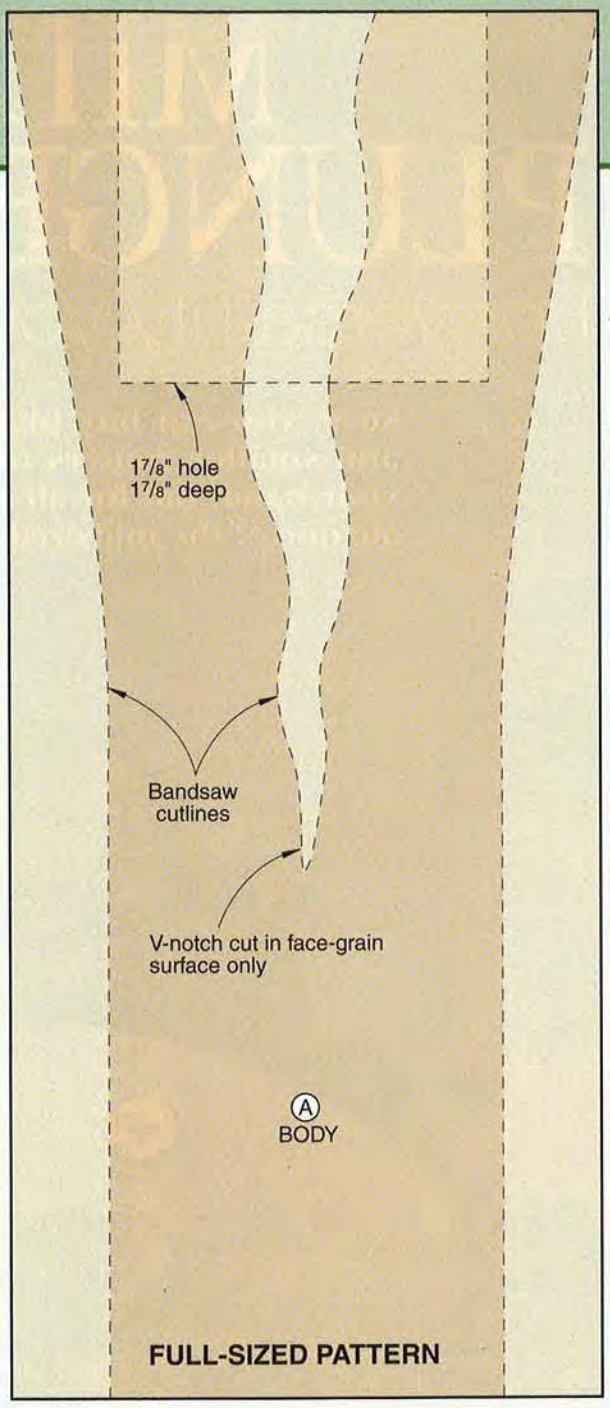
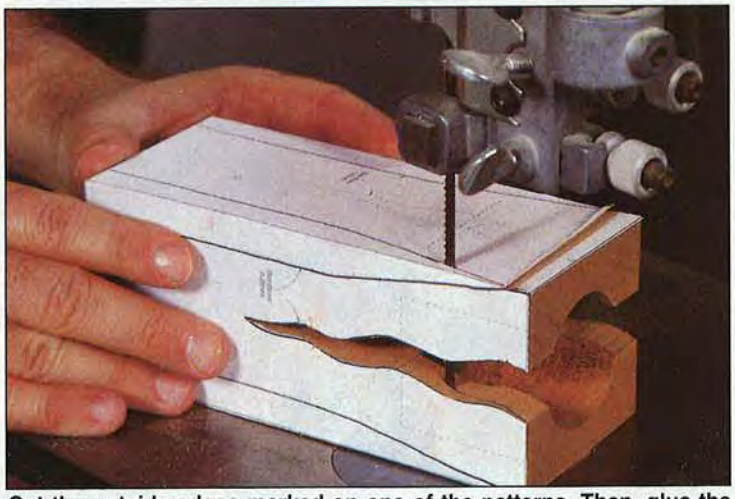






Cut the outside edges marked on one of the patterns. Then, glue the waste pieces back in place, and bandsaw the outside edges on the adjacent surface.

7 Cut the base (B) to 3×3" from ½" stock (we used walnut). Sand both the vase body and base smooth. Do not sand the V-notch.

8 Drill a countersunk mounting hole centered in the bottom of the base and into the center of the body. Screw the base to body. Be sure the screw head is recessed far enough so it will not scratch surfaces the vase is placed on.

9 Apply a clear aerosol finish to the project, being careful not to get too much finish in the notch, possibly creating runs. Rub with steel-wool between coats.

10 Fit the kenzan cup (also known as a flower-holder cup or "frog") into the hole in the vase body. Add a bit of water to the kenzan cup, and arrange a flower or two to your liking.

Buying Guide

Kenzan cup. 1 13/16"-diameter metal cup with spikes to support flowers. One for $8.50 ppd., or three for $19.50 ppd. Side Three Studio, 381 Fanker Road, Harmony, PA 16037.

Written by Marlen Kemmet
Project Design: John Seitz
Illustrations: Roxanne LeMoine
Photographs: John Hetherington

MIDSIZED PLUNGE ROUTERS

For versatility you can't beat them

Sure, you can buy bigger routers with gobs of power, and smaller routers that practically fit in the palm of your hand. But for all-around usefulness, you'll appreciate one of the midsized plunge routers reviewed here.

For this review we focused on plunge routers that advertise having from 1¼ to 2¼ horsepower. But, as we discovered early in our tests, advertised horsepower ratings are an inaccurate measure of actual power. Why? Some models with lower hp ratings actually out-muscled a few routers in the high end of our tested range. We soon discovered that rated amperage draw more realistically reflects actual power. So, in the chart at the end of this article, we rate the routers according to amps rather than hp.

Here's how we tested this group of routers

To review the 10 routers discussed here, we first carefully inspected each of them for such things as quality of construction, play between critical parts, and collet runout (determined with a dial indicator). Then, we put them through their paces making hundreds of with-the-grain and across-the-grain cuts in soft- and hardwoods, primarily red cedar and red oak. We used a wide variety of bits, concentrating our tests on popular styles such as straight and round-over bits. We made field and edge cuts, and even tried the routers on vertical surfaces and with templates. All along, we took note of key performance criteria such as power, ease of use, and smoothness of operation.

What separates these routers from other sizes

Our tested routers draw from 7.8 to 12.2 amps. They will effortlessly power most common bits through tough hardwoods, sometimes with just one pass. But as we discovered during our trials, if you frequently use bits with diameters over 1½", you should buy one of the routers in the upper end of our tested amperage range.

On the other hand, if you need a router that will handle bits over 2" in diameter, such as panel raisers, or need to make deep plunge cuts in one pass, you might be better off with a router that draws 15 amps. (See our review of these routers in the September 1995 issue.) Remember that such large routers weigh more than 11 pounds—quite a handful! Because of their weight, we most often mount 15-amp routers in a table.

Plunge routers excel at cuts in the field of a workpiece

A fixed-base router can't match a plunge router for safety and effectiveness at making cuts on the interior surface (field) of a workpiece. Examples of such cuts include stopped dadoes, mortises, inlay and template work, and sign-making tasks. The reason: With a plunge router you preset the cutting depth, then release a locking lever that permits the motor and bit to spring up to a noncutting height. To make the cut you switch on the machine and push the motor straight down until it contacts a depth stop. You engage the locking lever and make your cut. At the end of the cut you release the lock and the motor springs up again. With this straight-in, straight-out action you will get much better results than if you tried to make a field cut with a fixed-base router by tilting it in and out of the cut. On the other hand, plunge routers have no advantage over fixed-base routers on edge cuts.

Note: *If you don't need the field-cutting advantages of a plunge router, you may be better off purchasing a fixed-base router. We will review today's mid-sized, fixed-base routers in a future issue of* WOOD® *magazine.*

Key components of a plunge mechanism

When rating plunge routers we give high priority to the smoothness and effectiveness of their plunge mechanisms. Key among the components that make up this mechanism are the plunge rods, depth locks, depth scales, turret stops, and micro-adjustment mechanisms. Let's take a brief look at each.

•**Plunge rods.** All of the plunge routers ride up and down on two

Continued

The Bosch 1613EVS has a convenient in-handle trigger switch and an easy-to-reach spring-actuated locking lever.

FAST FACTS

•If you can own just one router, buy a midsized router. It will handle all but the biggest bits, and is agile enough for detail work.

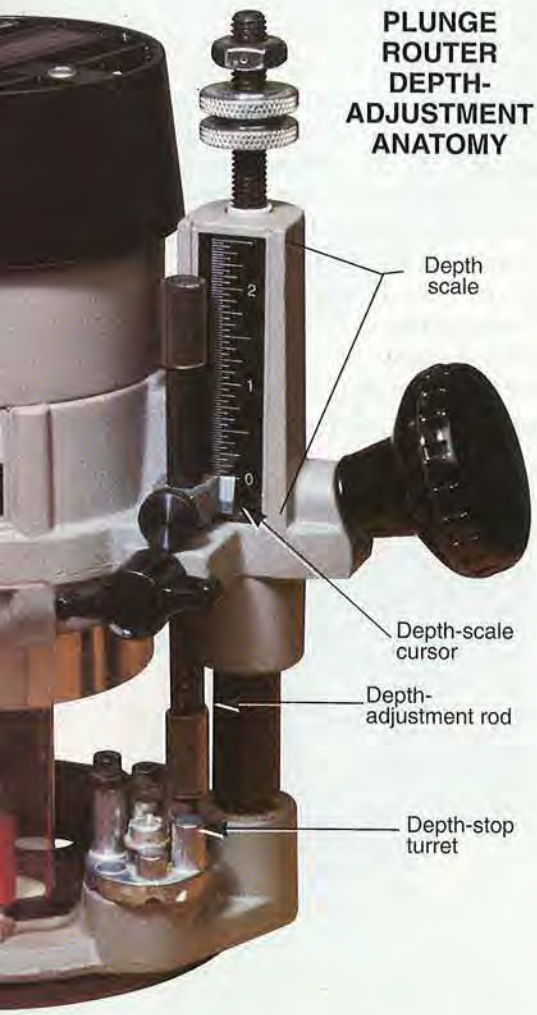
•A plunge router does everything a fixed-base router will, and works better on field cuts. The trade-off: Plunge routers cost more and are bulkier. You'll find fixed-base routers easier to handle.

•A high-quality router gives you smoother operation, easier handling, better longevity, and more accurate results. Most low-cost routers do not accept bits with ½"-diameter shanks, so with them you're limited to using smaller bits.

Print this article

steel rods. The quality of these rods, the springs within them, and the guide bushings that ride on the rods determines how easily and accurately the router plunges. Of the tested routers, the Porter-Cable 693 and DeWalt DW621 were the smoothest plungers. We rate all of the routers for "smoothness of plunge" in the chart at the end of this article.

•Depth locks. In the chart we also rate "ease of using depth locks." Here, our favorites were the Porter-Cable and Bosch plunge routers. They have easy-to-reach, spring-actuated locking levers as shown on the *previous page*. These routers, and the Ryobi R175, remain locked in all positions unless you rotate the lever.



You can disengage the spring-actuated lock on the Ryobi so that it works like the routers that have locking levers without springs. With these, the router "floats" on its rods until you activate the lock by pushing on a lever or twisting a knob.

Although we prefer plunge routers with spring-actuated levers, you might do better with one of the other routers if you use sign-making templates or the CMT Router Carver. With these, you need to repeatedly plunge the router as you move from one opening in a template to another. Under these circumstances, a spring-actuated lever will quickly fatigue your index finger.

•Depth scales. With any router you often find yourself adjusting the depth of cut. All of the tested plunge routers have some means of reading the depth on a scale, and a stop system for returning to one or more preset depths. Here, again, our favorites were the Bosch and Porter-Cable models. As shown *left*, the Porter-Cable 693 has an effective and smartly constructed depth-adjustment system. The system consists of an easy-to-read *depth scale*, a *cursor* that accurately indicates depth, and a *depth-adjustment rod* that halts the plunge at preset depths when the rod contacts one of six stops on the *depth-stop turret*.

With most of the routers we tested, you can "zero" the tool by locking it at the point where the tip of a straight or spiral bit just touches the work surface. Then, you set the adjustable cursor to zero on the scale. Set this way, the scale tells you the depth of your dado or mortise cuts.

•Turret stops. Since a project may require several cuts at various depths, you can preset these depths on the turret. By rotating the turret you can switch from one cut to another and maintain accuracy. Although some of the tested routers have turrets with as many as eight stops, in our experience we've never found a need for more than three stops.

•Micro-adjustment mechanisms. If you demand extreme accuracy when setting the depth of a cut, you won't find a better micro-adjustment mechanism

With the micro-adjustment knob on the Bosch plunge routers, you can make paper-thick changes in bit depth.

than the one on the Bosch models (see photo *above*). True to the ads for these routers, we actually were able to cut through a sheet of paper without damaging the surface beneath it.

More points to consider

•Overall quality. You'll find this rating in the chart for each of the tested routers. It's a good indicator of how well the router will hold up over time (especially important if you're a heavy user).

As an example of one of the things that separate an "excellent" router from a "fair" one in overall quality, see the photos *opposite page, top*. The better-made routers have cast-aluminum housings that surround the lower bearing. The aluminum supports the bearing more sturdily, and better dissipates heat, than plastic.

•Ergonomics. A lot of features go into rating how well a tool

Lower-cost routers have lower-arbor bearings supported by plastic (left). On high-quality routers these bearings are supported by aluminum (right).

The same Porter-Cable motor fits into the three bases shown from left: plunge, two-knob, and D-handle.

feels and functions in your hands. To arrive at the "ergonomics" rating in the chart, we considered the shape and placement of the handles, and the type and position of switches (we prefer trigger switches on all models).

• ***Versatility.*** If you want to enjoy the best of both a fixed-base and plunge router, but can afford just one, only Porter-Cable offers you a solution. As shown *above*, the same motor housing works with any of three different P-C bases. You can mix and match these components as necessary. For example, you can buy the fixed-base, D-handle router (model 691) for $160, and the plunge base alone for $80. (The D-handle base requires a motor with a short power cord, so you would need to use an extension cord with this motor and the plunge base.)

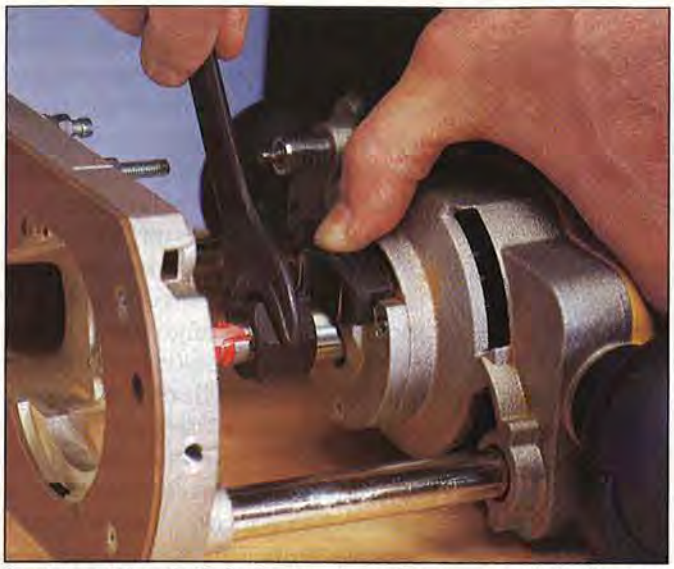
• ***Collets.*** Half of the routers in our test have collets that accept only bits with ¼" shanks, and the other routers accept both ¼" and ½" shanks. We strongly recommend that you buy a router that accepts both. You'll be happier in the long run because of the greater variety of bits that will fit in your router, and because of the added durability of the ½" shanks.

As noted in the chart, some of the routers have spindle locks similar to the one shown on the *left side of the next page*. These lock the shaft so you can adjust the collet with one wrench. But, we prefer the old-fashioned approach of using two wrenches as shown on the *right side of the next page*. Dual wrenches work together like plier handles to give you loads of leverage for loosening a collet. As we see it, the only advantage of shaft locks is that you have one less wrench to lose.

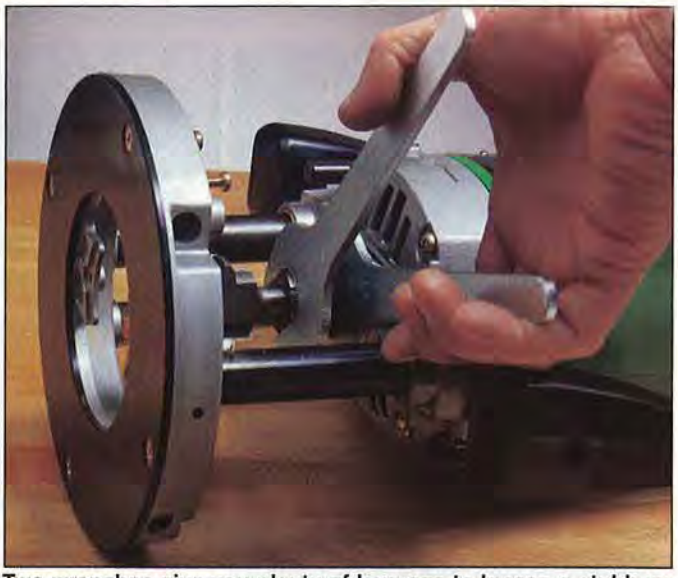
We've heard and read much about how some collets supposedly hold bits more securely, and with less runout, because they are longer, or have more slots milled in them. (Runout refers to the amount that an object spins out of a perfect orbit around its center.) These theories seem sensible enough, but our tests did not bear them out. All of the collets held securely when tightened properly, and although some had slightly more runout than others, we found no differences in cut quality attributable to collet runout.

• ***Variable speed.*** As the chart shows, only four of the tested

Continued



Routers with spindle locks require only one wrench for loosening collets, but we prefer the two-wrench system.



Two wrenches give you plenty of leverage to loosen a stubborn collet. No strain, no banged knuckles.

routers have a variable speed range. You'll appreciate this feature if you use bits over 1" in diameter, or if you work with woods that quickly burn (such as black cherry).

• ***Base opening.*** In the chart we list the size of the opening in the base of each router. Pay careful attention to this column if you plan to use bits over 1⅜" in diameter—bits that big will not fit through the opening in some of the routers. Also, note that with some routers you can make the opening larger by removing the plate attached to the base.

• ***Dust collection.*** Only one of the tested routers—the DeWalt DW621—has built-in dust collection. In our tests, the system worked effectively, catching nearly all of the dust in some situations. You can buy optional dust-collection accessories for the Bosch routers.

• ***Observed power.*** Although the "amps" column gives you a good idea of each router's power, we also rated "observed power" in the chart *right*. Here, we rated the relative cutting strength of each router by feel, sight, and sound as we routed workpieces.

HOW 10 MIDSIZED

MANUFACTURER/ IMPORTER	MODEL	AMPS	MOTOR: SPEED RANGE (RPMS)	SWITCH TYPE (1)	HANDLE TYPE (2)	TYPE (3)	COLLET: LENGTH (4) (INCHES)	COLLET: BIT SHANK CAPACITY-DIAMETER (INCHES)	SPINDLE LOCK (YES, NO)	NUMBER OF STOPS	TURRET: INDIVIDUAL STOPS ADJUSTABLE (YES, NO) (5)
BOSCH	1613EVS	11	12,000-23,000	TR	RE	3PSR	15/16	1/4, 1/2	Y	8	N
	1614EVS	7.8	12,000-22,000	TR	RE	3PSR	15/16	1/4	Y	8	N
DEWALT	DW615	8	8,000-24,000	SL	MK/SV	3PSR	1	1/4	Y	3	Y
	DW621	10	8,000-24,000	TR	MK	3PSR	1	1/4, 1/2	Y	3	Y
HITACHI	TR12	12.2	22,000	RO	RE	2P	1	1/4, 1/2	N	3	Y*
MAKITA	3621	7.8	24,000	TR	BK	3P	5/8	1/4	N	3	Y
PORTER-CABLE	693	10	23,000	TO	MK	3PSR	1 1/8	1/4, 1/2	N	6	Y**
RYOBI	R175	9	25,000	TR	RE	SA	1/2	1/4	Y	1	Y
SEARS	27510	12	22,000	TR	RE	M3PI	1	1/4, 1/2	Y	3	Y
SKIL	1835	9	25,000	RO	RE	3P	5/8	1/4	Y	1	N

NOTES:

1. (RO) Rocker
   (SL) Slide
   (TO) Toggle
   (TR) Trigger
2. (BK) Ball-shaped knob
   (MK) Mushroom-shaped knob
   (RE) Rabbit-ear shape
   (SV) Straight vertical handle
3. (SA) Split arbor shaft
   (2P) Two-piece
   (3P) Three-piece
   (3PSR) Three-piece self-releasing
   (M3PI) Modified three-piece integral
4. For models with split arbor shafts we measured the length of the split.
5. (*) Two stops are adjustable, one is fixed.
   (**) Three stops are adjustable, three are fixed.

WOOD MAGAZINE EDITORS' CHOICE OVER $125 1997 TM

WOOD MAGAZINE EDITORS' CHOICE OVER $125 1997 TM

WOOD MAGAZINE EDITORS' CHOICE UNDER $125 1997 TM

WOOD MAGAZINE EDITORS' CHOICE OVER $125 1997 TM

We give these routers the thumbs-up

Our favorite tools in this category are the Porter-Cable 693, Bosch 1613EVS, and DeWalt DW621. For a solid, versatile plunge router at a reasonable price, go for the P-C 693. If you require variable speed and micro-adjustment, buy the Bosch 1613EVS. And, if you put dust collection high on your priority list, take a good look at the DW621.

For the budget-conscious, occasional woodworker, the Ryobi R175 delivers good value.

Written by Bill Krier
Product testing: Dave Henderson
Photographs: Dean Tanner

PLUNGE ROUTERS RATE

	CUTTING DEPTH							EVALUATION (9)											
RANGE (6) (INCHES)	MICRO-ADJUST (YES, NO)	ADJUSTABLE TO ZERO	PLUNGE LOCK STYLE (7)	DIAMETER OF OPENING IN BASE (INCHES, WITH/ WITHOUT PLATE)	CORD LENGTH (FEET)	MATERIAL OF LOWER HOUSING FOR MOTOR AND BEARING (8)	NOISE (DECIBELS)	EASE OF CHANGING BITS	EASE OF OTHER ADJUSTMENTS	ERGONOMICS	SMOOTHNESS OF PLUNGE	EASE OF USING DEPTH LOCKS	OBSERVED POWER	OVERALL QUALITY	WEIGHT (POUNDS)	COUNTRY OF ASSEMBLY (10)	SELLING PRICE (11)	COMMENTS
2	Y	Y	SL	1 5/8	9.5	CA	97	G	E	E	G	E	E	E	10.1	U	$200	We like its high-quality electronics and convenient trigger switch in handle. Depth can be adjusted even with plunge mechanism locked.
2	Y	Y	SL	1 5/8	9.5	CA	99	G	E	E	G	E	G	E	8.0	U	145	Much like the 1613EVS, but it accepts only 1/4" bits. Like its big brother it has quick-change guide bushings.
1 15/16	N	N	TH	1 1/8, 2 1/2	10	CA	98	E	F	G	G	G	G	G	6.2	I	180	A competent performer, but too expensive for a router that accepts only 1/4" bits. Its long, vertical handle proved awkward.
1 3/4	Y	Y	TH	2 3/8	8	CA	99	E	E	G	E	G	E	E	8.8	I	220	Well-designed dust-collection system captures nearly all debris on some cuts. Like DW615, it has a knob handle that doubles as a plunge lock.
2 7/16	N	N	L	1 7/8	8.5	CA	104	F	G	G	G	G	E	E	11.0	J	200	Has loads of power and solid construction. Collet design makes stubborn bits hard to remove.
1 3/8	N	Y	L	2 3/8	7	PL	102	G	G	E	G	E	G	G	5.7	J	150	Has good power considering its compact size. On-handle trigger switch is comfortable. Versatility limited by its accepting only 1/4" bits.
2 1/2	Y	Y	SL	1 1/8, 3 5/8	7	CA	103	E	E	G	E	E	E	E	10.7	U	185	Our favorite router. Highlights include smooth plunge action, plenty of power, and sturdy construction. Lacks variable speed and has less-than-convenient toggle switch.
2	N	Y	SL	2 1/2	8	PL	106	E	E	G	G	G	G	F	7.5	U	100	Looks like a Bosch 1614EVS, but has compromises in features and quality to keep price down. Okay for the occasional woodworker.
2 1/2	N	Y	SH	2 1/2	10	CA	105	E	E	G	G	F	E	E	11.4	U	185	It's got the power and a fairly high price, but it just wasn't convenient to use. Comes with a depth-adjustment knob.
2	N	N	L	2 7/8	8	PL	110	F	F	G	F	G	F	F	6.9	U	90	An entry-level router that performs marginally. Bit changes proved frustrating because collet jams up.

6. Vertical range of bit measured with the motor housing fully raised and fully lowered.
7. (L) Lever
(SL) Spring-loaded lever
(SH) Squeeze handle
(TH) Twist handle
8. (CA) Cast aluminum
(PL) Plastic
9. E Excellent
G Good
F Fair
P Poor
10. (I) Italy
(J) Japan
(U) United States
11. Based on lowest available price at time of article's production.

MANUFACTURERS' LISTING:

Bosch
773/286-7330

DeWalt
800/433-9258

Hitachi
800/546-1666

Makita
800/462-5482

Porter-Cable
800/487-8665

Ryobi
800/525-2579

Sears
Call or visit your local Sears store

Skil
773/286-7330

WOOD THAT

Impervious to the cannonballs of opposing ships, the frigate *USS Constitution* earned the nickname "Old Ironsides." Here's a rundown of the wood that contributed to her fame.

Completed in 1797 at Boston, Massachusetts, the wooden warship *USS Constitution* was constructed from material contributed by nearly every state in the new nation. One of three oversized frigates (a three-masted vessel) built to replenish the U.S. Navy following the Revolutionary War, she carried provisions for a 475-man crew, had 44 guns, measured 204' long, and weighed 1,500 tons. Because she was heavy, *Constitution* proved slow and cumbersome under sail.

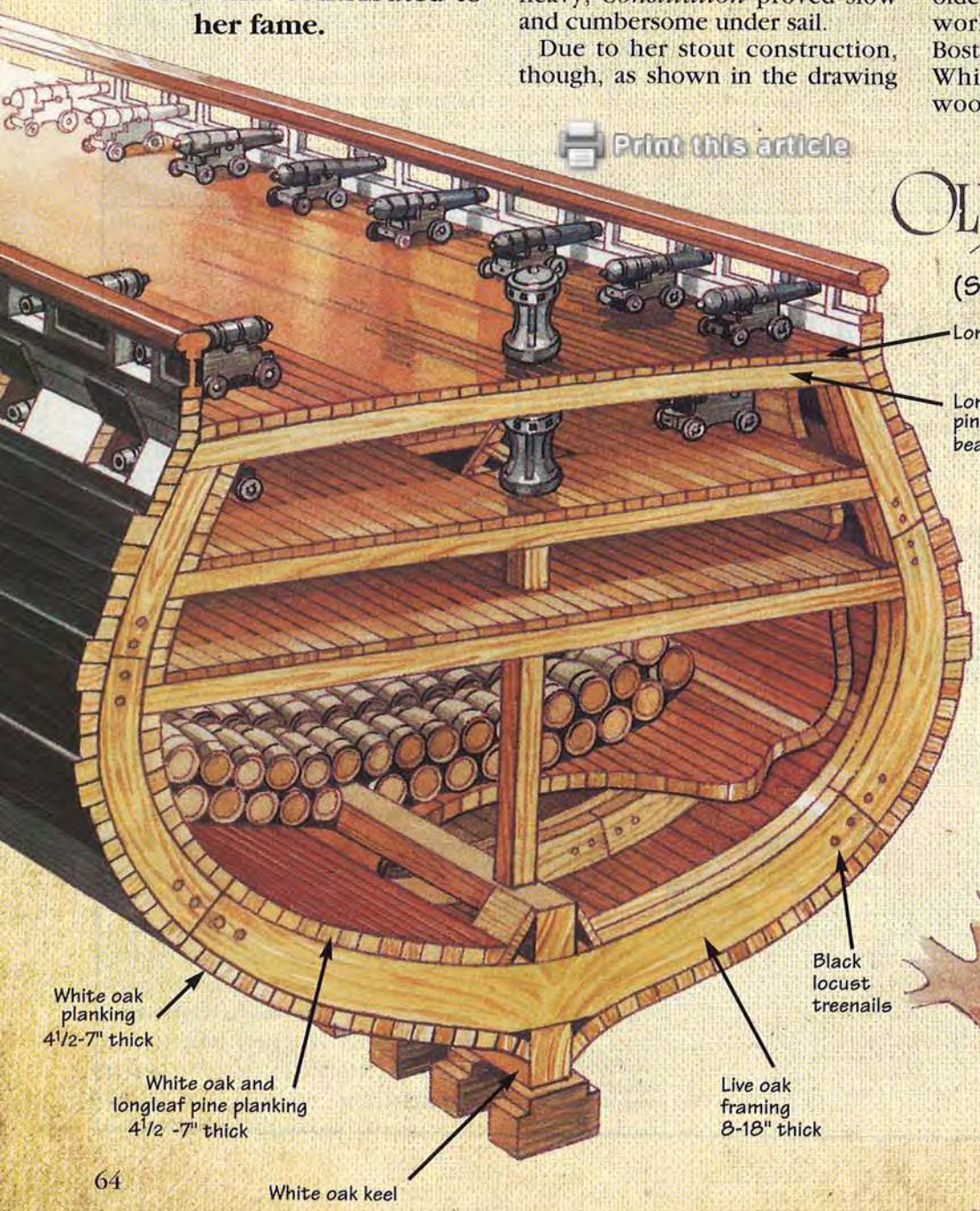
Due to her stout construction, though, as shown in the drawing *below*, she was notoriously tough-skinned under fire. In a battle with the English warship *Guerrie`re* during the War of 1812, so much shot from the English guns bounced off her sides that sailors fondly called her "Old Ironsides" from then on.

The *USS Constitution* actively served her country (as a training vessel and later a barracks ship), with several rebuildings, until 1934. Still in commission as the oldest warship afloat of any of the world's navies, she is docked at Boston's Charlestown Navy Yard. White oak, live oak, and other woods used in her construction

Print this article

ANATOMY OF OLD IRONSIDES

(Simplified from actual)


Longleaf pine decking
Longleaf pine beams
White oak planking 4½-7" thick
White oak and longleaf pine planking 4½ -7" thick
White oak keel
Black locust treenails
Live oak framing 8-18" thick

WENT TO WAR

White oak (*Quercus alba*)
Uses: Horizontal exterior-hull planking, bent inside planking, planking nearest the keel, and keel timbers.

Hard, heavy, straight-grained, and decay-resistant, the wood of white oak contributed much to the *Constitution*. And unlike the rather short and gnarled live oak, white oak trees grow to 150' tall to provide long, clear planks. When Old Ironsides was being built, white oak was plentiful throughout the Union's 13 states.

Blacklocust (*Robina seudoacacia*)
Uses: Treenails (pronounced "trunnels") to pin the ship's timbers together.

In the 1700s principally found in Pennsylvania and Virginia, black locust wood rates as stronger and stiffer and nearly as long-lasting as white oak. The tree's smaller height and diameter, however, prevented its extensive use for framing and planking.

Eastern white pine (*Pinusstrobus*)
Uses: Ship's masts, cabinetry, millwork and trim.

Growing throughout much of the young nation, eastern white pine was a massive tree—250' tall with a trunk 6' in diameter. The straight-grained, stable, and lightweight wood is comparatively non-resinous for a pine.

Longleaf pine (*Pinus palustris*)
Uses: Beams and decks.

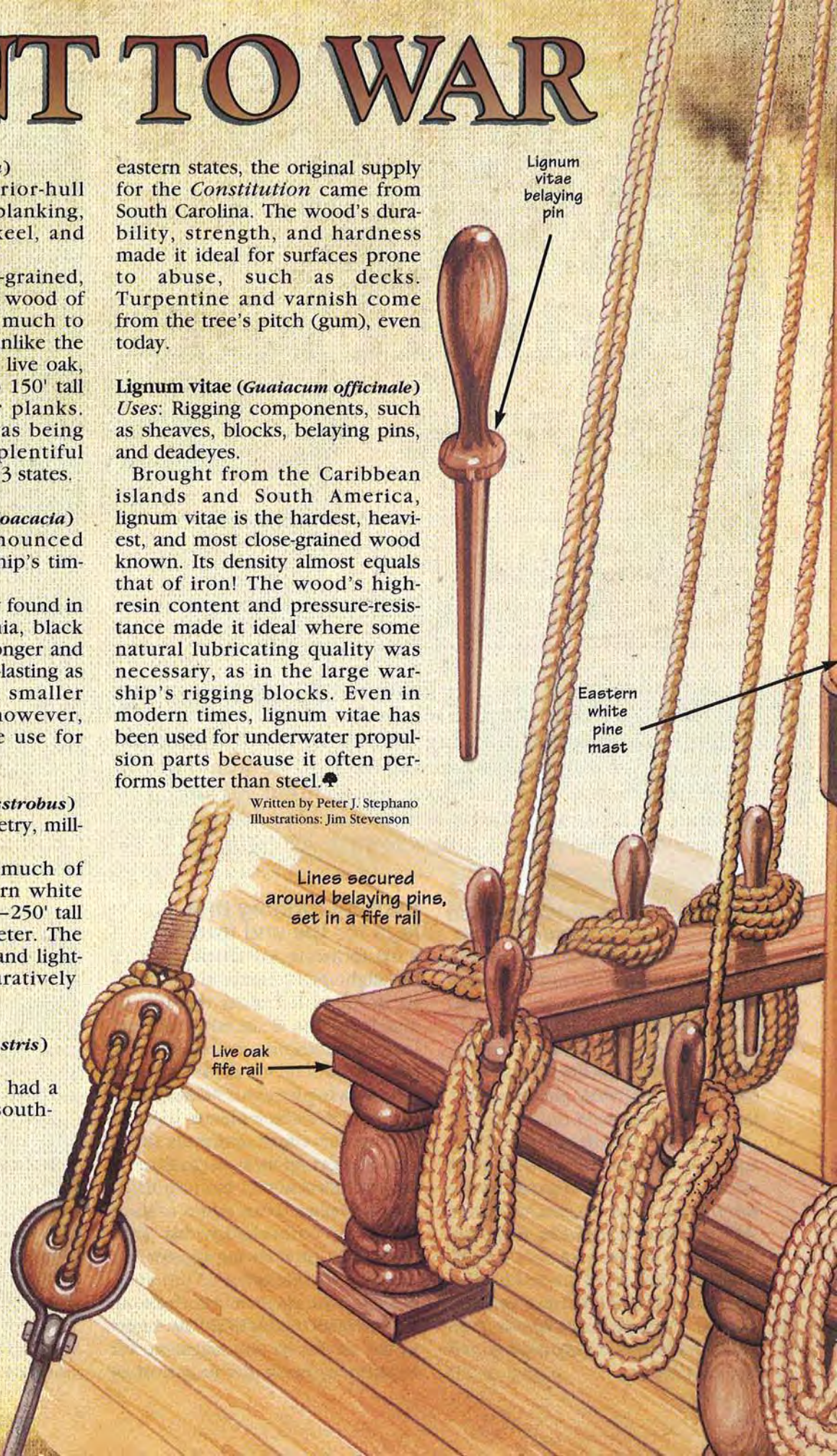
Although longleaf pine had a range throughout the southeastern states, the original supply for the *Constitution* came from South Carolina. The wood's durability, strength, and hardness made it ideal for surfaces prone to abuse, such as decks. Turpentine and varnish come from the tree's pitch (gum), even today.

Lignum vitae (*Guaiacum officinale*)
Uses: Rigging components, such as sheaves, blocks, belaying pins, and deadeyes.

Brought from the Caribbean islands and South America, lignum vitae is the hardest, heaviest, and most close-grained wood known. Its density almost equals that of iron! The wood's high-resin content and pressure-resistance made it ideal where some natural lubricating quality was necessary, as in the large warship's rigging blocks. Even in modern times, lignum vitae has been used for underwater propulsion parts because it often performs better than steel.

Written by Peter J. Stephano
Illustrations: Jim Stevenson

Deadeyes, made of lignum vitae, were used to keep shrouds and stays taut.


Lignum vitae belaying pin
Eastern white pine mast
Lines secured around belaying pins, set in a fife rail
Live oak fife rail

The Mission Tradition Lives On

Matching Futon Recliner And Ottoman

In the February 1996 issue, we published the plans for a beautiful full-sized futon sofa. You responded with many letters of thanks and expressed a strong interest in matching pieces. Since we try never to let down our readers, we went right to work developing this matching set—a futon recliner and ottoman. In issue 104, March of 1998, we plan to treat you to the complementary coffee table, shown *at far right*.

Note: *We built our recliner frame around a standard chair size (6×28×54") futon mattress and our ottoman around a standard small (6×22×28") futon mattress. Although the recliner is extremely comfortable for sitting, the length of cushion makes it less than desirable for sleeping when fully reclined.*

To order the February 1996 issue (#86) with the futon sofa article with the full-sized patterns on the pattern insert, contact WOOD Back Issue Sales, P.O. Box 9255, Des Moines, IA 50306. Or, call 800/572-9350 to order. The issue is $4.95 plus $2 shipping. Due to the large size of the full-sized patterns, photocopies are not available.

Start by forming the legs for the end frames

1 To form the 1½"-thick legs (A), cut eight pieces of ¾"-thick stock to the size listed in the Bill of Materials *plus* ¼" in width and ½" in length. (Since 1½"-thick oak can be difficult to find, we laminated two pieces of ¾" stock to form the 1½"-thick pieces.)

2 With the edges and ends flush, glue and clamp two pieces face-to-face to form each of the four legs.

3 Cut or plane both edges of each leg for a 3¼" finished width. Trim both ends of each leg (A) for the 20¼" finished length.

4 Using the Parts View drawing on the *WOOD PATTERNS*® insert in the center of the magazine for reference, mark the location of the grooves and two mortises on the *inside edge* of each leg (A). Hold the legs together face-to-face and use a square to verify that the marked mortises align.

5 Repeat the process in Step 4 to mark the location of the mortise on the *inside face* of each leg.

6 Use your drill press, fence, and a Forstner bit centered over the joint line to drill ¾" holes 13⁄16" deep to remove most of the stock from each marked mortise. As shown in the photo *at right*, use a chisel to square the mortises.

Now, machine the remaining end-frame pieces

1 To form the 1½"-thick bottom and top rails (B, C), cut ¾"-thick stock to the sizes listed in the Bill

Print this article

Although any one of these pieces would be nice alone, we strive to do a "roomful of furniture," allowing you to make a complete matching set.

After removing most of the waste from the marked mortises with a Forstner bit, complete the mortises with a chisel.

of Materials plus ¼" in width and ½" in length.

2 Glue and clamp the pieces together, and later cut the rails (B, C) to the finished sizes listed in the Bill of Materials.

3 Purchase enough oak wainscoting for the two end frames (we purchased ours at a local home center). Measure the thickness of the wainscoting (ours measured 5/16" thick, but they may differ slightly). Now, use a router and a straight bit or a dado blade to cut a 5/16" groove centered along the inside edge of each leg. Whether using the tablesaw or table-mounted router, you'll need to use a stop to end the groove at the mortise. The groove needs to be as wide as your wainscoting is thick.

4 Cut a 5/16" groove centered along the *top* edge of the bottom rails (B). Cut the same width of groove 1¼" deep along the *bottom* edge of the top rails (C).

5 Using the dimensions on the Tenon detail accompanying the Recliner End Frame drawing for the bottom side rails (B) and the Parts View drawing for the top side rails (C), cut the tenons on each end of each rail (B, C). (We cut these on our tablesaw.)

6 Transfer the curved cutline from the Parts View drawing, and cut and sand the bottom edge of the top rails (C) to shape.

7 Crosscut the oak wainscoting (D) to length.

Continued

It's time to assemble the oak end frames

1 Dry-clamp (no glue) each end frame to check the fit. You'll need to trim the outside edge of each outside piece of wainscoting. The outside edges of the wainscoting should protrude into the ⅜"-deep groove about 5/16". Also mark the taper cutline on the bottom of each leg so the top end of the taper stops just below the point where the bottom rail (B) meets the leg (A).

2 Cut the tapers, and sand to remove the saw marks.

3 Glue and clamp each end frame together, checking for square. (We ran a thin bead of glue in the grooves in the bottom and top rails to keep the wainscoting from rattling in the finished frame. We did not glue the tongue-and-groove joints between the individual wainscoting pieces.) Wipe off all excess glue with a damp cloth.

4 Cut the armrests (E) to size. Rout ⅛" round-overs along all edges of each armrest.

5 Glue and clamp an armrest to the top end of each end frame. The inside edge of each armrest overhangs the inside surface by ⅛", and the armrests are centered front to back on the top end of each frame.

Cut a pair of rails for joining the end panels

1 Cut and laminate ¾"-thick stock for the front and rear rails (F) just like you did for the legs (A).

2 Trim the rails to finished size, and cut a tenon on each end of each rail to the size shown on the Tenon detail accompanying the Recliner Exploded View drawing. For proper clearance of the assembled seat and backrest assemblies between the end frames, keep the distance between the tenon shoulders 28" as dimensioned on the drawing.

3 Glue and clamp the front and rear rails (F) between the end frames, checking for square.

Next, the backrest uprights

1 Cut and laminate ¾"-thick stock to form the backrest uprights (G). Cut the uprights to finished size. See the Recliner Seat and Backrest drawing for reference.

2 Clamp the uprights edge-to-edge, and use a square to lay out the centerpoints for the holes on the *outside* face of each where dimensioned on the Recliner Seat and Backrest drawing. On the *inside* face of each, mark the location for the rabbets and dadoes.

3 Remove the clamps, and drill the 5/16" holes.

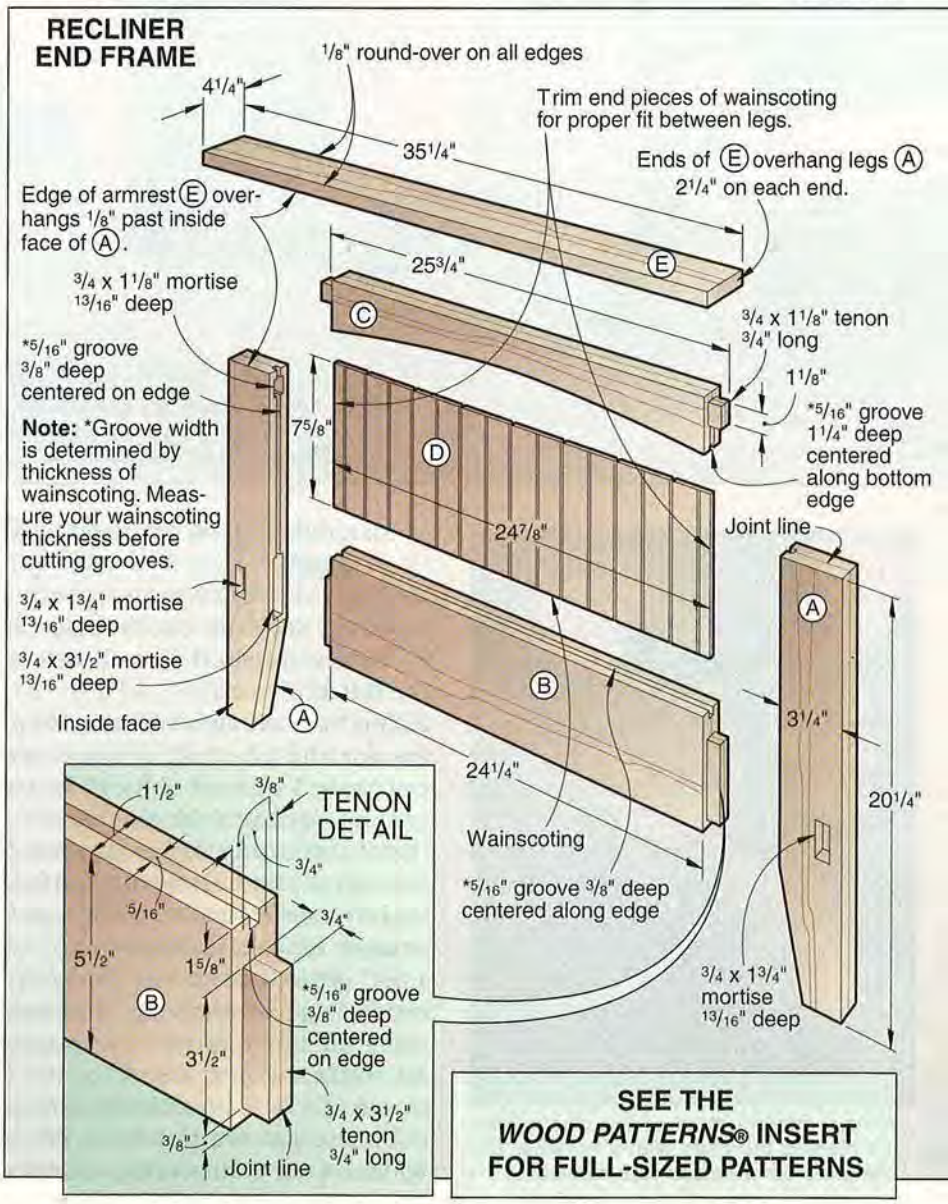
4 Cut the 1½" dado ¾" deep in each upright where marked. (We did this on a tablesaw fitted with a dado blade.) Then, cut the ½" rabbet ¾" deep where marked.

Cut the remaining seat and backrest pieces

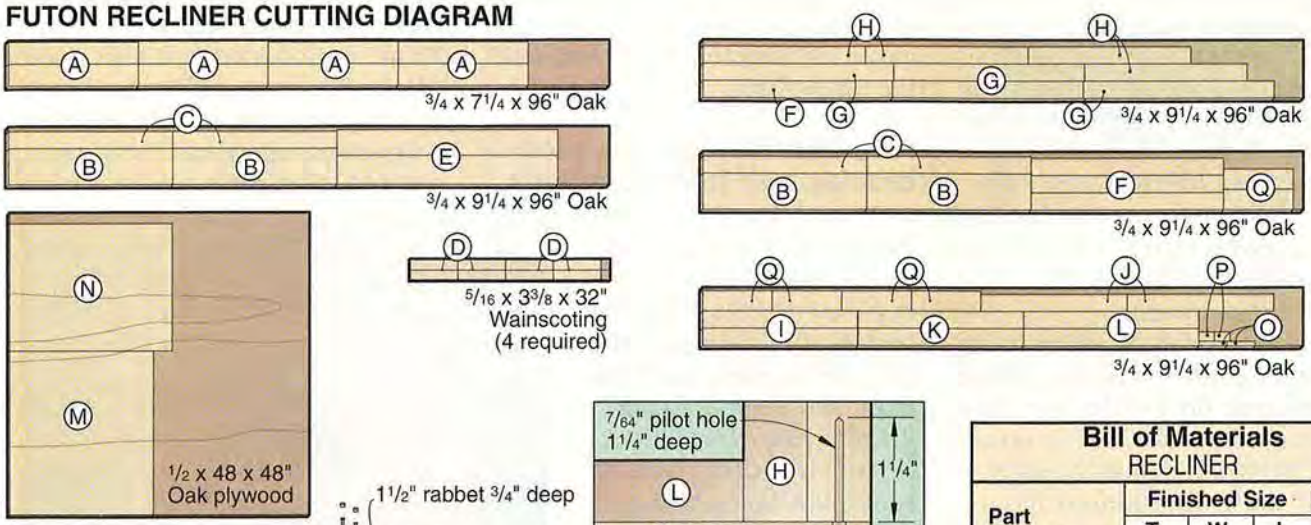
1 Cut and laminate ¾"-thick stock to form the 1½"-thick seat ends (H), backrest top and bottom crossmembers (I, J), and seat crossmembers (K, L).

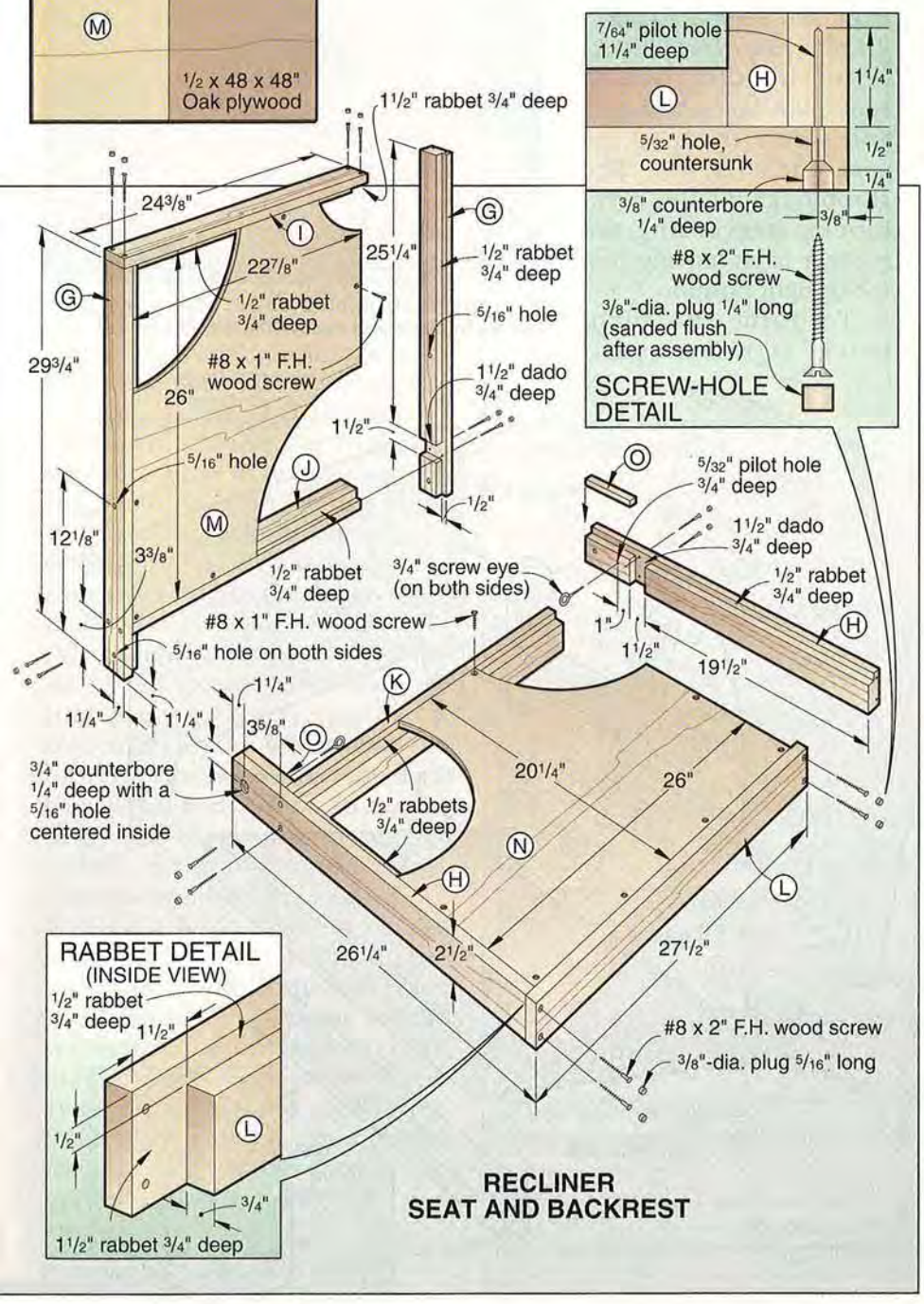
2 Cut pieces H-L to the sizes listed in the Bill of Materials. *For a proper fit of the seat and backrest assemblies between the end frames cut crossmembers (I-L) to the exact lengths listed in the Bill of Materials.*

Continued


RECLINER END FRAME
1/8" round-over on all edges
4 1/4"
Trim end pieces of wainscoting for proper fit between legs.
35 1/4"
Ends of (E) overhang legs (A) 2 1/4" on each end.
Edge of armrest (E) overhangs 1/8" past inside face of (A).
25 3/4"
3/4 x 1 1/8" mortise 13/16" deep
3/4 x 1 1/8" tenon 3/4" long
*5/16" groove 3/8" deep centered on edge
1 1/8"
*5/16" groove 1 1/4" deep centered along bottom edge
7 5/8"
Note: *Groove width is determined by thickness of wainscoting. Measure your wainscoting thickness before cutting grooves.
24 7/8"
Joint line
3/4 x 1 3/4" mortise 13/16" deep
3/4 x 3 1/2" mortise 13/16" deep
Inside face
3 1/4"
20 1/4"
24 1/4"
Wainscoting
*5/16" groove 3/8" deep centered along edge
TENON DETAIL
1 1/2"
3/8"
3/4"
5/16"
5 1/2"
1 5/8"
*5/16" groove 3/8" deep centered on edge
3 1/2"
3/4 x 3 1/2" tenon 3/4" long
Joint line
3/4 x 1 3/4" mortise 13/16" deep
SEE THE WOOD PATTERNS® INSERT FOR FULL-SIZED PATTERNS

FUTON RECLINER CUTTING DIAGRAM


A A A A
3/4 x 7 1/4 x 96" Oak
C
B B E
3/4 x 9 1/4 x 96" Oak
N
M
1/2 x 48 x 48" Oak plywood
D D
5/16 x 3 3/8 x 32" Wainscoting (4 required)
H H
F G G
3/4 x 9 1/4 x 96" Oak
C
B B F Q
3/4 x 9 1/4 x 96" Oak
Q Q J P
I K L O
3/4 x 9 1/4 x 96" Oak



Bill of Materials
RECLINER

Part	Finished Size T	W	L	Matl.	Qty.
END FRAMES					
A* legs	1½"	3¼"	20¼"	LO	4
B* bottom side rails	1½"	5½"	25¾"	LO	2
C* top side rails	1½"	2¾"	25¾"	LO	2
D wainscoting	5/16"	3⅜"	7⅝"	OW	16
E armrests	¾"	4¼"	35¼"	O	2
F* front & rear rails	1½"	2½"	29½"	LO	2
SEAT AND BACKREST					
G* backrest uprights	1½"	2½"	29¾"	LO	2
H* seat ends	1½"	2½"	25½"	LO	2
I* backrest top crossmember	1½"	2½"	24⅜"	LO	1
J* backrest btm. crossmember	1½"	2½"	22⅞"	LO	1
K* seat back crossmember	1½"	2½"	26"	LO	1
L* seat front crossmember	1½"	2½"	27½"	LO	1
M seat panel	½"	26"	22⅞"	OP	1
N seat panel	½"	20¼"	26"	OP	1
STOP AND PIVOT BLOCKS					
O filler blocks	½"	¾"	4½"	O	2
P stopblocks	¾"	1½"	2½"	O	2
Q* pivot blocks	1 1/16"	3¼"	11⅛"	LO	2

*Initially cut parts marked with an * oversized. Trim to finished size according to the instructions.

Materials Key: LO–laminated oak, OP–oak plywood, OW–oak wainscoting, O–oak.

Supplies: #8×1" flathead wood screws, #8×1½" flathead wood screws, #8×2" flathead wood screws, #8×2½" flathead wood screws, 4–5/16" carriage bolts 3½" long with 5/16" locknuts and washers, ¾" screw eyes, stain, clear finish, bungee cord.

3 Drill a ¾" counterbore ¼" deep on the outside face and 1¼" from the back end of each seat end (H) where shown on the Recliner Seat and Backrest drawing. Drill a 5⁄32" hole ¾" deep on the inside face where shown for the screw eyes.

4 Cut a rabbet across each end of the crossmember (I) where dimensioned on the Recliner Seat and Backrest drawing.

5 Cut a ½" rabbet ¾" deep along the top edges of parts H–L where dimensioned on the Recliner Seat and Backrest drawing to house the ½" plywood panels M and N.

6 Drill the counterbored mounting holes, and then glue and screw the backrest (G, I, J) together, checking for square. Measure the opening, and cut the backrest panel (M) to fit. Screw it in place.

7 Repeat the process just described to glue, clamp, and screw together the seat assembly (H, K, L, N).

8 Use a plug cutter to cut sixteen ⅜" plugs 5⁄16" long. Glue a plug into each counterbore. Later, sand the plugs flush.

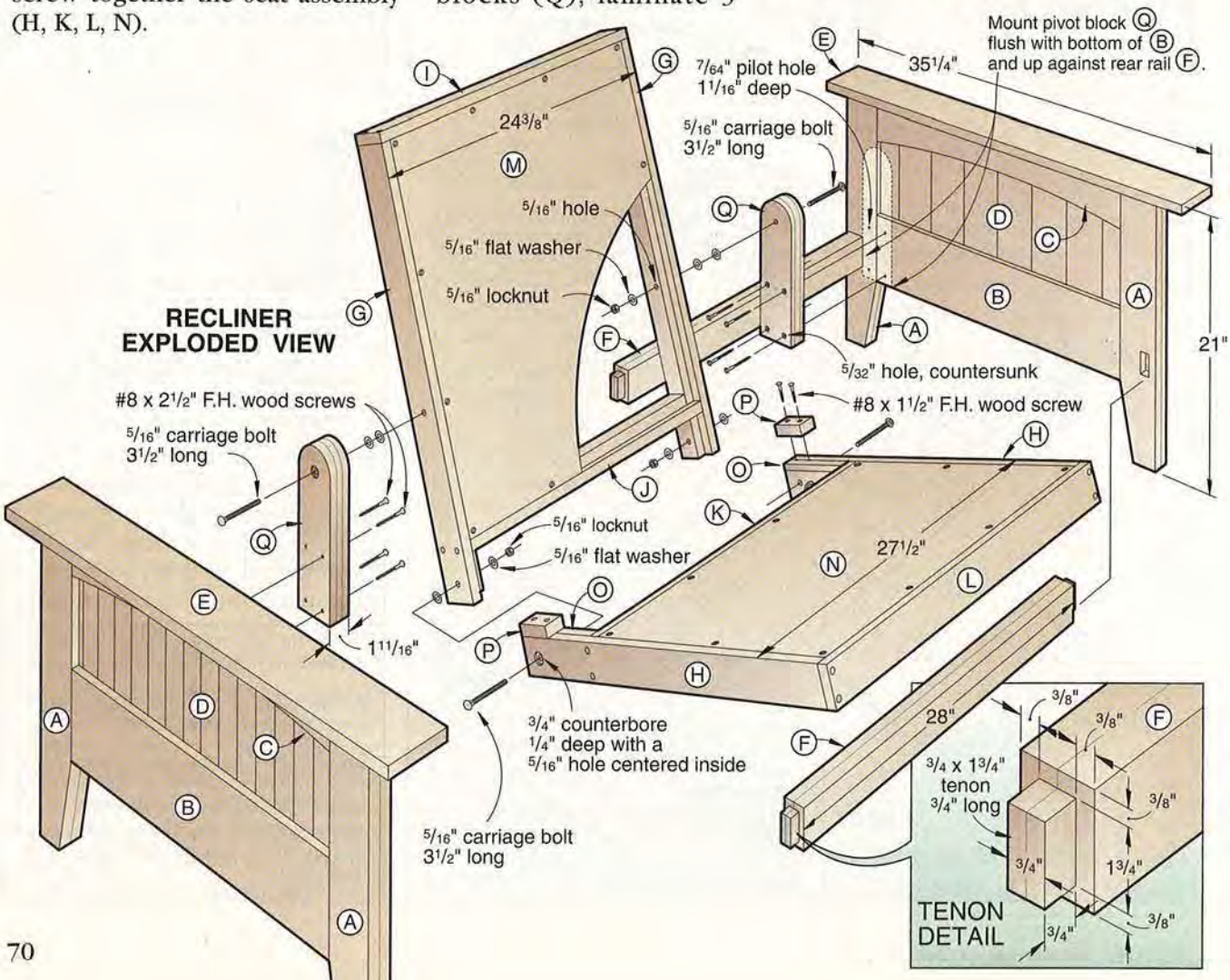
Add the filler blocks, stopblocks, and pivot brackets

1 Cut a pair of filler blocks (O) to size, and glue them into the exposed rabbets along the back end of each seat end (H) where shown on the Exploded View drawing.

2 Cut a pair of stopblocks (P) to size, drill countersunk pilot holes, and glue and screw them to the seat ends (H, O). The stopblocks hit the pivot blocks, preventing the recliner from moving past the upright position.

3 To form the pivot blocks (Q), laminate 3 pieces of ¾×3½×12" oak face-to-face with edges and ends flush. Plane the block blanks to 1 11⁄16" thick. Then, transfer the pivot-block pattern and hole centerpoints from the Parts View to the pivot-block blanks. Cut the pivot

With the chair upside down, clamp the pivot blocks in place and secure them with screws.



blocks (Q) to shape. Drill the countersunk and counterbored holes where dimensioned on the drawing. Clamp (no glue) the pivot blocks in place to the rear legs (A). Using the holes just drilled in the pivot blocks as guides, drill pilot holes into the inside face of the legs. Remove the clamps, and set the pivot blocks aside for now. You'll attach them later.

Sand, stain, finish, and assemble

1 Finish-sand the end frames, rails, backrest, seat, and pivot blocks.

2 Stain, if desired (we left ours natural), and apply a clear finish to all parts.

3 Drive the ¾" screw eyes into the back inside faces of the seat ends where shown on the Recliner Seat and Backrest drawing.

4 Use a pair of 5/16" carriage bolts 3½" long with flat washers and locknuts to connect the seat to the backrest where shown on the Exploded View drawing. Then, do the same to connect the pivot blocks to the backrest assembly.

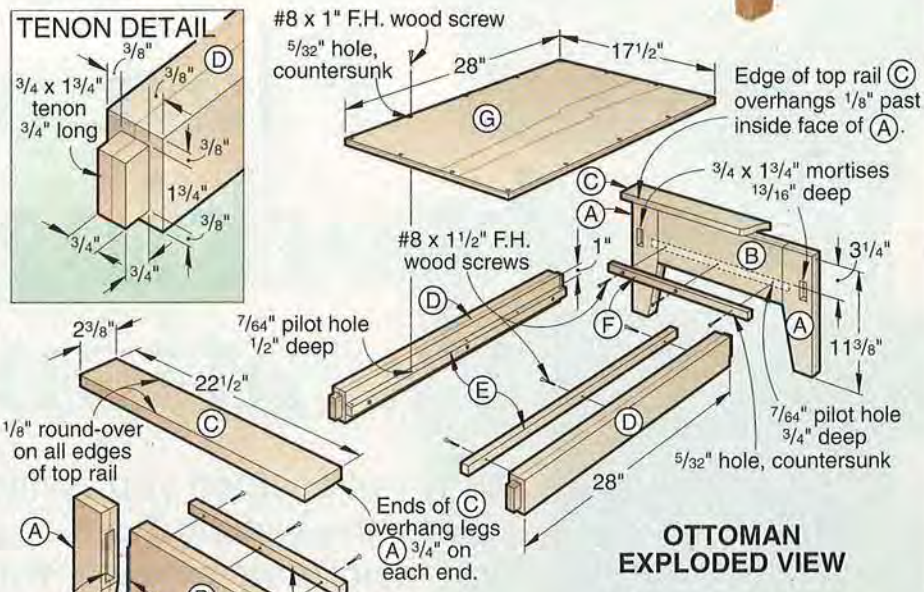
5 With the aid of a helper, position the seat/backrest assembly facedown on your workbench. (We used a pad to protect the finish.) Then, position the base over the assembly. Lift the seat/backrest assembly up and clamp the pivot blocks in place on the legs. Use 2½" wood screws to secure the pivot blocks to the legs as shown in the photo *above left*. Turn the recliner right side up.

6 Place a futon cushion on the recliner in the fully reclined position. To hold the cushion in place and keep it from slipping off the recliner, hook one end of a 20" bungee cord to one of the screw eyes, bring the cord around the front of the cushion, and connect the other end of the cord to the opposite screw eye.

Written by Marlen Kemmet
Project Design: Chuck Hedlund
Illustrations: Kim Downing; Lorna Johnson
Photographs: Bill Hopkins

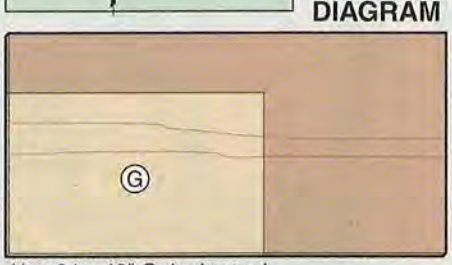
The ottoman comes next

Using the Ottoman Bill of Materials *below*, the Ottoman Exploded View, and the ottoman leg and cleat patterns on the Parts View, construct this matching piece of furniture. Follow the same construction procedure used to build the futon recliner.

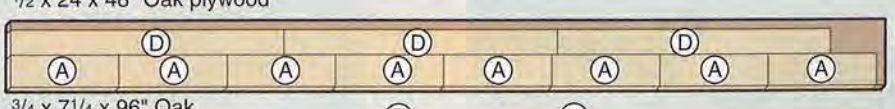


OTTOMAN EXPLODED VIEW

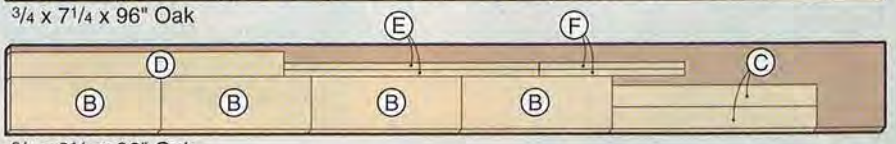
OTTOMAN CUTTING DIAGRAM



1/2 x 24 x 48" Oak plywood



3/4 x 7 1/4 x 96" Oak



3/4 x 9 1/4 x 96" Oak

Bill of Materials
OTTOMAN

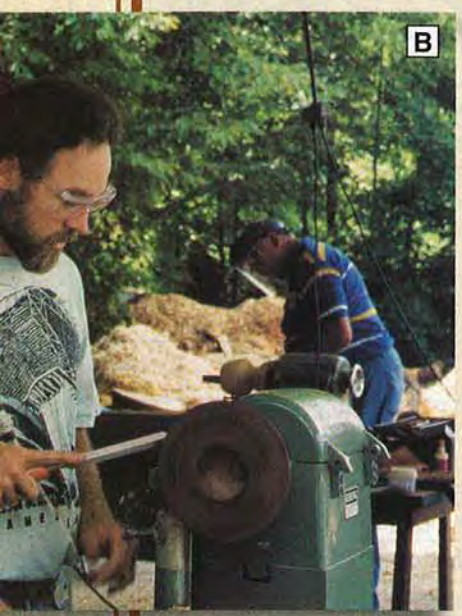
Part	Finished Size T	W	L	Matl.	Qty.
A* legs	1½"	3¼"	11⅜"	LO	4
B* side rails	1½"	5½"	16"	LO	2
C top rails	¾"	2⅜"	22½"	O	2
D* stretchers	1½"	2½"	29½"	LO	2
E cleats	¾"	¾"	28"	O	2
F cleats	¾"	¾"	16"	O	2
G panel	½"	17½"	28"	OP	1

*Initially cut parts marked with an * oversized. Trim to finished size according to the instructions.

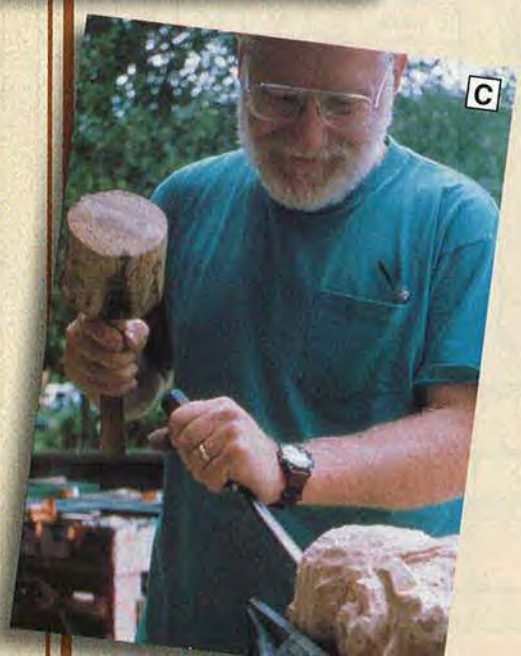
Materials Key: LO–laminated oak, O–oak, OP–oak plywood.

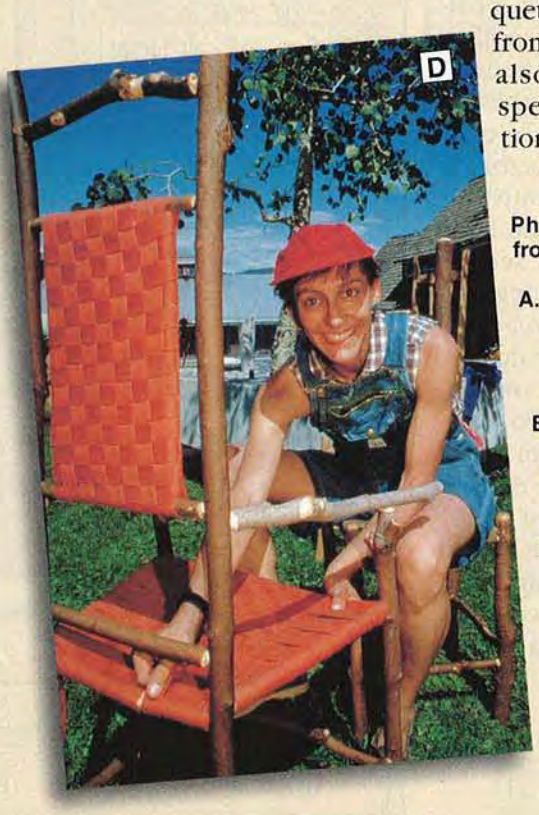
Supplies: #8x1" flathead wood screws, #8x1½" flathead wood screws, stain, clear finish.

How to Plan a Woodworking Vacation



Why not sharpen your skills under the watchful eye of a woodworking expert? You can do that on a woodworking vacation.





Print this article

Have you ever thought about spending time rubbing elbows with a master craftsman? Each year, thousands of woodworkers do just that.

They hone their skills by attending workshops, often held in some of the nation's most picturesque settings. And besides learning a new technique or type of woodworking, they meet others with similar interests and different skill levels. So whether you're an eager beginner or a practiced professional, you'll fit right in.

But because woodworking workshops are so diverse, you'll need to carefully weigh your options before you start packing. The following advice will help.

How much time can you afford to spend?

Vacation-type workshops offer everything from Windsor chairmaking to bowl turning and marquetry. They also vary in length from a few days to a week. You also can sometimes arrange specialized, personal instruction to fit your schedule. The

Photographs, counter-clockwise from upper left:

A. Furnituremaker Sam Maloof annually shares his skills with students at Anderson Ranch, in Colorado.

B. At Tennessee's Arrowmont School of Arts and Crafts, there's a high-intensity focus on woodturning.

C. At some schools, carving and wood sculpture may be part of the class offerings.

D. Centers such as Anderson Ranch normally offer other courses, such as weaving.

minimum may be a day or two, and all facilities don't offer this.

The best thing to do when you write for information is to state as closely as you can the month you want to attend, and the length of time you have available. That's because shorter or weekend workshops sometimes aren't listed in the workshop brochures.

Should you go by yourself or include the family?

No matter what workshop you take, you'll work wood. But how comfortable you feel will make the difference between a so-so experience and an unforgettable one.

Generally, workshops fall into the following categories. Each has an emphasis and atmosphere that's quite different.

• ***Woodworking and other crafts.*** Well-known centers such as Arrowmont, in Tennessee, or the Brookfield Craft Center, in Connecticut, offer classes in woodworking concurrently with classes in clay, glass, photography, weaving, and other interests. This means that your spouse and/or children might find taking a workshop in one of these other crafts appealing. Taking a workshop at one of these types of facilities provides the opportunity for a real family vacation, especially if it is situated in a particularly scenic area with recreational possibilities.

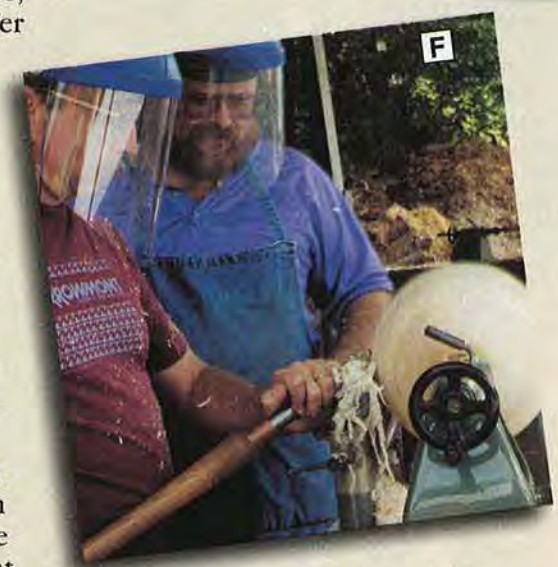
• ***Strictly woodworking.*** Intensive describes this type of atmosphere. Because only specialized woodworking courses are offered, only woodworkers attend. For example, the woodturning seminars held at Craft Supplies USA, in Utah, are taught by top turners, but that's all there is. At Marc Adams School of Woodworking, in Indiana, you can learn machine maintenance, joinery, and other woodworking subjects from experts for a weekend or a week. The facility's huge, modern shop allows space for every student to have a workbench.

So if you're the only one in your family interested in woodworking, go by yourself. Unless, of course, the locale has something to offer other family members while you're in the workshop.

• ***Special-focus workshops*** feature a little-known aspect of woodworking, such as Old-World chip carving or pioneer treenware. Unlike the intensive, strictly woodworking atmosphere, this type of facility usually offers companion courses from the culture or historical era that may be of interest to non-woodworkers.

At the Norwegian-American Museum called Vesterheim, in Iowa, you can learn how to carve or make bent-wood boxes. But there are courses in such techniques as tole painting and knifemaking. The Augusta Heritage Arts Workshop, in West Virginia, offers pioneer crafts, like log-cabin building and basketry, plus folk arts such as square dancing.

With these options available, you'll have to do some advance planning. If your family will go, and members want to take courses, check if there's a minimum age. Also inquire about meals, lodging, and what to do in the area. If you do decide to take a workshop alone, the most important consideration will be the instructor, so find out all you can about him or her and the workshop content. You might even call the facility and speak directly, or at least get the names of some people who have taken the course.



E. Professional Roger Cliff is a regular instructor at Indiana's Marc Adams' School of Woodworking.

F. At some schools, the emphasis is on technique, while working under the instructor's watchful eye.

Will you have to pay anything extra?

Cost is the bottom line. Here, numerous aspects can impact your wallet and travel budget.

• ***Every workshop has a basic fee.*** What does it include? Some include meals, snacks, and materials. In others, the stated cost only covers the instruction. If the workshop brochure doesn't itemize what the fee covers, you'll have to do some additional calculating.

• ***Add up food and lodging.*** In a campus-like setting, such as at Arrowmont, you can live like college students in dormatories at rea-

Continued on page 86

COURTLY

Despite its genteel air, this stately tea cart serves decidedly utilitarian purposes, from side table to rolling buffet. But foremost, it's a beautiful piece of furniture that's an ideal showcase for your finest craftsmanship.

First, turn the legs

Note: You can purchase the legs and handle already turned. See our Buying Guide on page 78

1 Cut stock for the two back legs (A) and two front legs (B) 1" longer than shown on the Bill of Materials. Mark the center on each end of each piece by drawing diagonal lines.

2 Referring to the Full-Sized Patterns for the legs (in the *WOOD PATTERNS*® insert in the middle of the magazine), lay out the 9"-long section for turning on each leg where shown. (We marked the top of the turned section 7¼" from the top, which allows ½" extra at both the top and bottom for trimming the completed leg to length.)

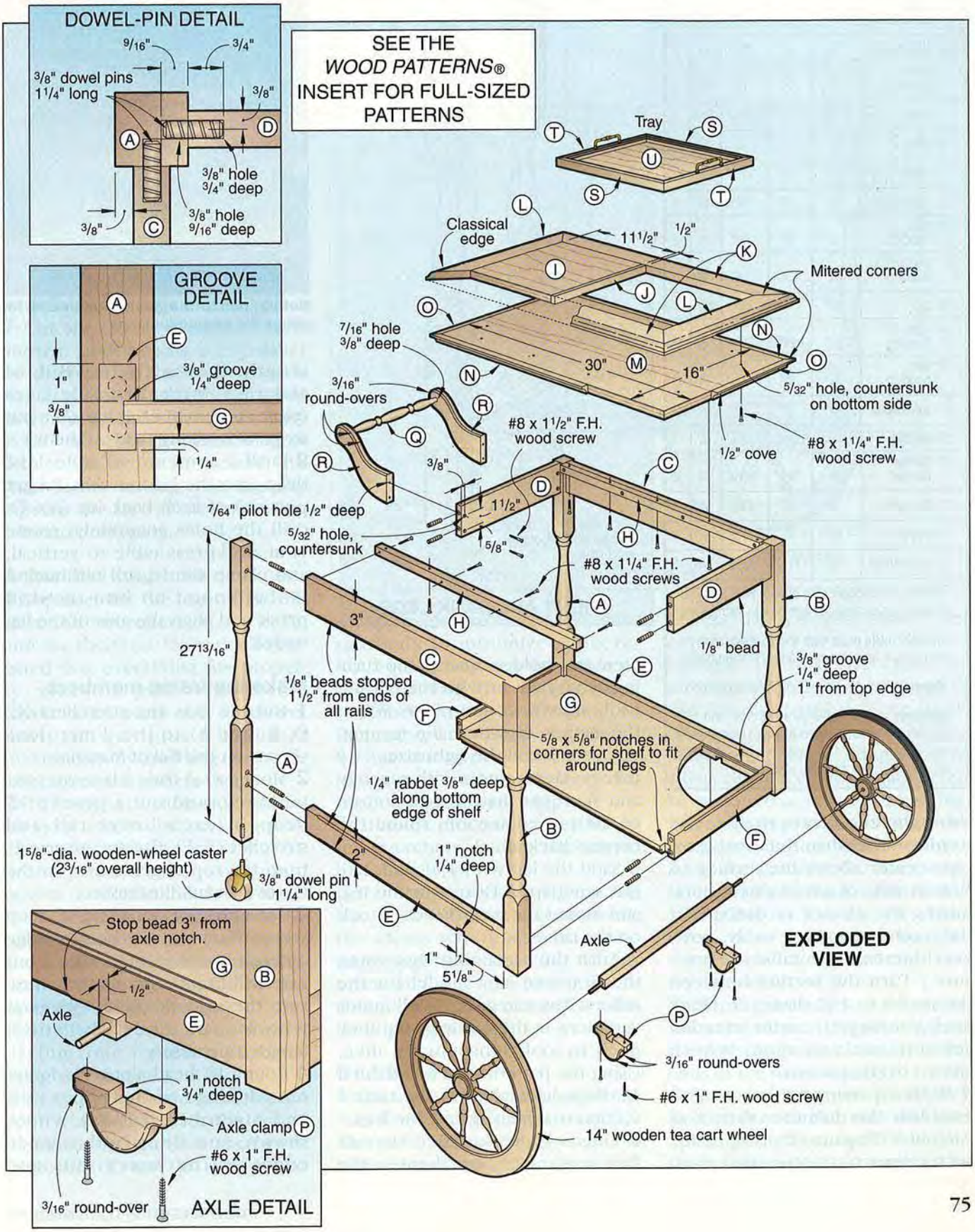
3 Mount the stock between centers on your lathe. (We used a cup-type dead center in the headstock, shown *right*, and a rotating cup-type center in the tailstock.

Continued

Install a cup center in the headstock instead of a spur-type drive center.

CART

A furniture classic for teatime and much more



COURTLY CART

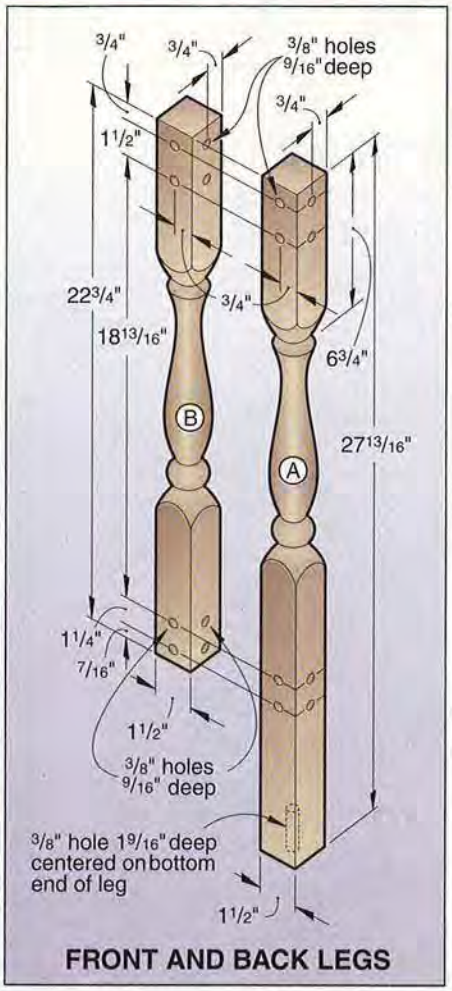
Bill of Materials					
Part	Finished Size			Matl.	Qty.
	T	W	L		
A* back leg	1½"	1½"	27 13/16"	W	2
B* front leg	1½"	1½"	22¾"	W	2
C upper rail	¾"	3"	27"	W	2
D upper stretcher	¾"	3"	13"	W	2
E lower rail	¾"	2"	27"	W	2
F lower stretcher	¾"	2"	13"	W	2
G shelf	¾"	14¼"	28¼"	WP	1
H cleat	¾"	¾"	27"	W	2
I** insert	¾"	12"	11½"	WP	1
J* insert edge	¾"	½"	12"	W	1
K* side molding	¾"	3"	32"	W	2
L* end molding	¾"	3"	18"	W	2
M top	¾"	16"	30"	WP	1
N**side banding	¾"	¾"	31½"	W	2
O**end banding	¾"	¾"	17½"	W	2
P axle clamp	¾"	2"	4"	W	2
Q* handle	1" dia.		12⅛"	W	1
R handle bracket	¾"	3 9/16"	9 13/16"	W	2
S* tray side	¾"	¾"	13⅞"	W	2
T* tray end	¾"	¾"	11⅞"	W	2
U tray bottom	¼"	11⅛"	13⅛"	WP	1

* Initially make longer than shown, then cut to finished size in accordance with how-to instructions.

** Initially make wider than shown, then cut to finished size in accordance with how-to instructions.

Materials Key: W–walnut, WP–walnut plywood.

Supplies: ⅜×1¼" dowel pins, #8×1¼" and 1½" and #6×1" flathead wood screws, wooden tea cart wheels, axle, 1⅝" wooden-wheel casters, drawer pulls, glue, finishing supplies.



FRONT AND BACK LEGS

Set caliper to the desired diameter to gauge the parting-tool cuts.

Using the cup center to drive the turning rather than the usual spur-type center allows the turning to stop in case of a tool catch, minimizing the chance of damage. If the turning stops too easily, however, increase the tailstock pressure.) Turn the section between the marks to 1⅜" diameter. Draw lines A through D on the rounded section, placing them where shown by the pattern.

4 With a parting tool, cut in to establish the diameter shown at each line. To gauge the size easily, set a caliper to the specified diameter, and hold it against the turning as you cut in with the parting tool, shown *above right*. When the caliper slips over the turning, you've reached the right size.

5 Form the features with a gouge and skew. At the top and bottom of the turned section, round the corners back ½".

6 Sand the leg with 150- and 220-grit sandpaper. Dismount the leg, and mount the next piece of stock on the lathe.

7 Turn the remaining legs, using the first one as a model for the others. You can get by with minor variations in the turnings, but they need to look substantially alike. Using the pattern, you could cut a cardboard template of the turned section to match against the legs.

8 Once you're satisfied that all four legs match, cut them to the length shown in the Bill of Materials. Mark the inside faces (your choice) of each leg. (We put strips of masking tape on them.)

9 Drill a centered ⅜" hole 1 9/16" deep into the bottom (the longer portion) of each back leg (A). To drill the holes accurately, rotate your drill-press table to vertical, and clamp the leg to it. Chuck a ⅜" brad-point bit into the drill press, and align the axis of the leg with it.

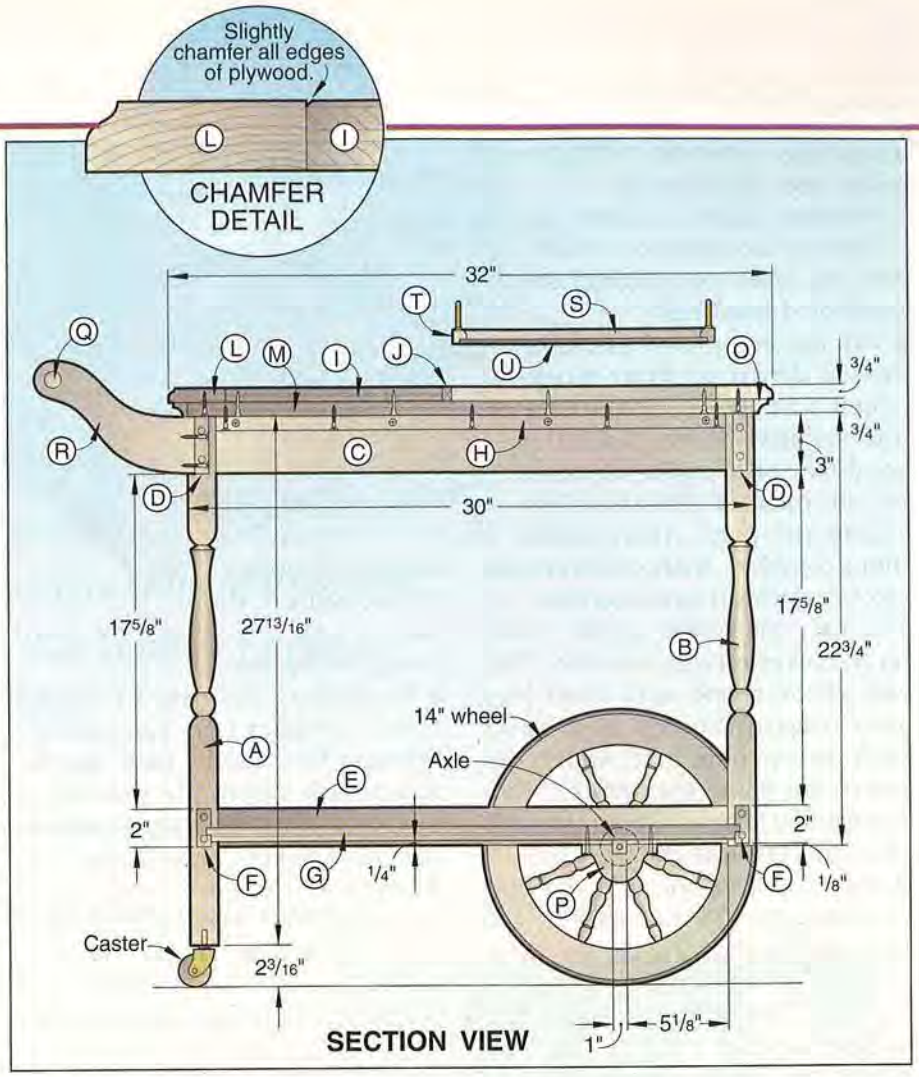
Make the frame members

1 Cut the rails and stretchers (C, D, E, and F) to the dimensions shown on the Bill of Materials.

2 Mount a ⅜" dado blade on your tablesaw, and cut a groove ¼" deep in each lower rail and stretcher (E, F). Cut the groove 1" from the top edge, shown in the Groove Detail illustration.

3 Cut a notch 1" long and ¼" deep where shown in the bottom edge of each lower rail (E). The front axle will fit into the notches; measure the axle supplied with your wheels, and adjust the notch length if necessary.

4 Rout a ⅛" bead along the lower outside edge of the upper rails and stretchers (C, D) where shown, and along both outside edges of the lower rails and



stretchers (E, F). On the lower edge of the lower rails (E), stop the bead 3" from the axle notch.

5 Mark centers for the ⅜" dowel-pin holes on the inside faces of the legs marked earlier. Before drilling the holes, stand the legs in order in a rectangular array to verify that each set of holes faces another set. Drill the holes with a doweling jig to ensure accuracy.

6 Drill mating holes in the ends of the upper and lower rails and stretchers where shown. On the lower rails and stretchers (E and F), the groove faces in and runs near the lower edge of each part.

7 Cut shelf G to the dimensions shown. Rout or saw a ¼" rabbet ⅜" deep along the bottom ends and edges to fit into the grooved lower rails and stretchers. Saw ⅝×⅝" notches in the corners where shown to fit around the legs. Before sawing, put masking tape on the face at the corners to minimize chipping.

Assemble the frame

1 Dry-assemble the legs (A, B), the rails and stretchers (C, D, E, F), and the shelf (G). Once you're satisfied that everything fits properly, glue the parts. The frame involves 13 parts and 32 dowel pins; you can glue it together most easily by building two side assemblies and joining them.

2 To construct each side assembly, join a front and back leg with an upper and lower rail. The groove on the lower rail should face in, as should the dowel holes in the leg. The beaded edge of the upper rail should face out. Clamp, and square by measuring the diagonals across the inside of the opening. Allow the glue to dry. (We allowed about one hour's drying time for each glue-up, using yellow glue.)

3 Next, lay one side assembly on your workbench with the dowel holes facing up. Glue the lower stretchers (F) and the shelf (G) to it. Apply glue to the shelf joints sparingly to minimize squeeze-out. Square between the inside of the legs and the tops of the stretchers, using a try square or framing square. Clamp until dry.

4 Glue the upper stretchers (D) into place, the beaded edges facing out. Square and clamp.

5 Glue the other side assembly to the stretchers. Square the assembly, and clamp.

6 Cut the two cleats (H) to the size shown. Drill and countersink the cleats where shown in the Exploded View drawing. Then, screw and glue one to the inside face of each upper rail (C), with the top edges flush.

Go for the top

1 Cut a piece of walnut plywood ¾×12½×11½" for the insert (I). This is ½" wider than shown. On both ends, form a chamfer of 1/16" or less. The chamfer should not expose layers beneath the face veneer. To rout the chamfer, chuck a ½" V-grooving bit (such as the Freud 20-104 that we used) into your table-mounted router. Make test cuts on scrapwood to adjust the fence and cutting depth to produce a suitable chamfer. After routing, don't change the setup; you'll use it again shortly.

2 Cut the stock for the insert edge (J) ½" longer than specified—12½". Glue the piece to one chamfered end of the insert. When dry, cut the insert/edge assembly to finished width—12".

3 Chamfer the edges of the insert, using the same setup you used on the ends. Stop the chamfers at the ends of the insert edge (J).

4 From stock longer than specified, miter-cut the side and end moldings (K, L) to finished length. Glue the moldings around the

Continued

insert/edge assembly, with the insert edge (J) facing in.

5 Install a classical pattern bit in your table-mounted router. Rout the outer top edge of the assembled moldings.

6 Lay the completed assembly upside down on your workbench. Cut the top (M) to the dimensions shown. With the good face of M down, center it on the back of the assembly. Clamp the parts, then screw them together with countersunk #8×1¼" flathead wood screws.

7 Center the frame upside down on the inverted top assembly. The end of the frame with short legs goes toward the end of the top with the opening in it. Attach the top to the frame with #8×1¼" flathead wood screws driven through the cleats (H) into the top (M).

8 Rout stock for the side and end banding (N, O). For safety, we routed the ½" cove along the edges of wider stock, then ripped ¾" from the edge to form the banding. Miter-cut the banding pieces, and attach them to the top with glue and brads.

Attach the axle

1 Photocopy the pattern for the axle clamp (P). Temporarily laminate two blanks with double-faced tape, and apply the pattern to the top of the stack. Bandsaw the parts, and sand to the line.

2 Separate the parts, and rout a 3/16" round-over along both curved edges. Drill and countersink the screw holes where indicated.

3 Center the axle in the lower rails' slots. Place a clamp over the axle on each rail, and attach with #6×1" flathead wood screws.

Add the handle

1 Turn the handle (Q) from a 1⅛×1⅛×14" piece of stock. Follow the general procedures described for turning the legs. Center the handle turning on the blank, and turn the ends to ⅜"-diameter tenons. Then, when completed, trim it to length by shortening the tenons.

2 Photocopy the pattern for the handle bracket (R). Temporarily laminate two blanks with double-faced tape, apply the pattern to the top of the stack, and bandsaw the two brackets. Sand to the line.

3 Separate the parts, and rout a 3/16" round-over along both curved edges. Referring to the pattern, drill a 7/16" hole ⅜" deep in each bracket. Drill facing sides to make left and right brackets.

4 Installing the handle will be easier with the top and frame assembly upside down. Lay out and drill the four 5/32" screw holes on the upper rear stretcher (the one at the long-legged end).

5 Glue the brackets onto the ends of the handle. Take care to keep the brackets parallel and to align the mounting surfaces.

6 Hold the handle in position. Then, reach in from the back and push a screw or awl through one of the screw holes to mark one of the brackets. Drill a 7/64" start hole at the mark, and screw the handle to the upper stretcher with one screw. Mark the other locations.

7 Remove the handle, and drill the other three holes. Screw the handle on permanently.

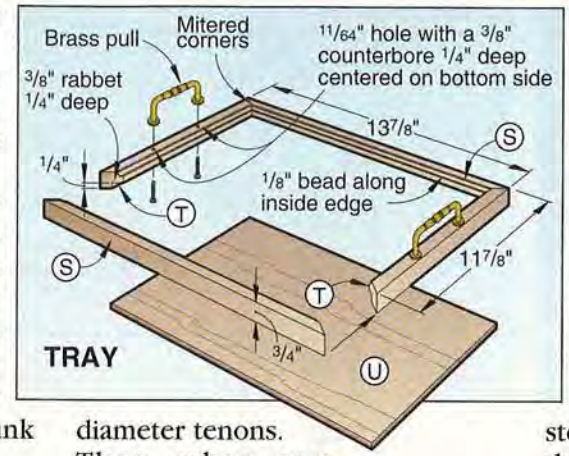
Now, build the tray

1 Form stock for the tray sides and ends (S, T) from a piece of ¾×2" material about 30" long. Start by routing a ⅜" rabbet ¼" deep along each edge on one face. Then, flip the stock over, and rout a ⅛" bead along both edges on that face.

2 Rip ¾" from each edge of the routed piece to make the tray stock. Plane or sand the sawn edge—it will show.

3 Cut the tray bottom (U) to the size shown. Test its fit in the top recess. Miter-cut the sides and ends from the routed stock, and assemble them around the bottom.

4 After the glue dries, mark the locations for the handle screws on top of each end. Drill 11/64" holes through the ends at the marks. On the bottom, guide on the holes to drill ⅜" counterbores ¼" deep.



Get that wagon rollin'

1 Finish-sand the tea cart and tray. Apply a clear finish (we sprayed on three coats of polyurethane). Let the finish dry thoroughly.

2 Push the large wheels onto the axle until they click into place. Drive the caster sockets into the holes in the bottom of the back legs. Insert the caster stems into the sockets. Stand the tea cart up.

3 Attach the handles to the tray ends. Finally, set the tray into the opening in the top.

Buying Guide

Wheels and hardware. One pair walnut wheels (90WP16), one axle (90WP18W), two wooden casters (7C4A), and two brass pulls (SBH27). For current prices, call 800/223-8087. Constantine's, 2050 Eastchester Rd., Bronx, NY 10461.

Turned legs and handle. Four legs and handle turned from walnut. $62.00 ppd. in U.S. Schlabaugh and Sons, 720 14th St., Kalona, IA 52247. Or call 800/346-9663 to order.

Project Design: David Ashe Illustrations: Kim Downing; Lorna Johnson Photographs: John Hetherington

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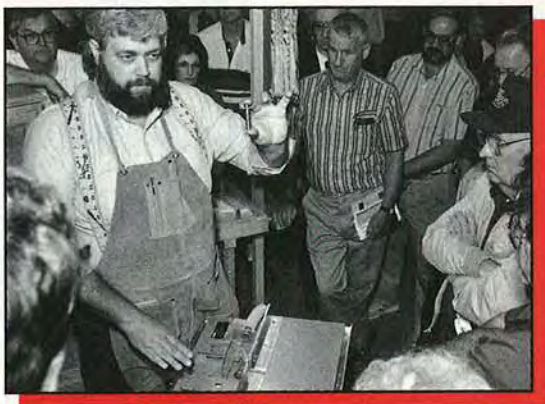

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PITCH PINE

The tree that fueled the Army of Independence

Barely an hour's drive east of Philadelphia lies a 2,400-square-mile area that still approaches wilderness. Called the Pine Barrens, this part of New Jersey played an important role in Colonial America and a vital one in the Revolutionary War.

The Pine Barrens did not represent valuable land back then. Just the opposite—the soil was boggy and sandy, as it remains to this day. But the land did support a thick forest of pine trees. And in the damp, soggy ground one could find iron ore.

To early Americans, that combination of pitch pine (*Pinus rigida*) and iron ore was heaven sent. That's because iron ore was transformed into iron by melting it to remove impurities, a process called smelting, and the fuel of choice was wood charcoal rather than the mined coal of later times. The resinous pitch pine—its sappy, hard-to-work wood seldom desired—proved perfect as a source of charcoal.

So began the intensive "mining" of the Pine Barrens. Colonists extracted the iron ore from the ground and felled the surrounding pitch pine for smelting. From the iron, blacksmiths crafted tools, hardware, and weapons. In fact, iron that originated in the Pine Barrens was forged into guns that fed the War for Independence, and later, the War of 1812.

Over the centuries, the pitch pine forests were extensively cut for fuel, and for the building of barns and bridges. Forest fires also raged. Scrub oaks replaced the virgin forest, so shading the younger pines that they became stunted. But even today, the Pine Barrens has not yielded to agriculture or extensive development.

Charcoal makers piled and burned pitch pine for charcoal to feed the iron smelters in Colonial America.

Illustration: Jim Stevenson

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The 1996 BUILD 'A-TOY® Contest Winners

Everyone's really a winner in *WOOD*® magazine's annual Build-A-Toy contest. That's because all toys entered are sold at auction. Then, the money raised buys new toys for needy kids through the U.S. Marine Corps Reserve's Toys for Tots program. So, in addition to the 1996 contest prizewinners listed on this page, you'll also find the names of the top money raisers from last year's auction. Turn to *page 8* for photographs of the top prizewinning toys.

Best toy entry (original design only, all divisions)

Frank Ryan, Eugene, Ore.; 16-piece Imagine-A-Toy; $3,000 in Delta tools.

Home Hobbyist (original design)

Grand prize. Larry Weaver, Petersburg, W.Va.; farm tractor and disc; $2,100 in Craftsman stationary machines.

First prize. Jack Dalton, Jackson, S.C.; 1934 Chevy pickup; Grizzly machines valued at $2,000.

Second prize. Bob Schnare, Hull, Mass.; fire truck; $1,000 in Bosch tools.

Third prize. George Cole, Sequim, Wash.; steamroller and tender; $500 in Dremel tools.

Professional (original design)

Grand prize. Neil Seely, Rochester, N.Y.; ferryboat with six cars; $2,000 in DeWalt tools.

First prize. Mike Jagielo, Almond, Wis.; bed bug pull toy; $1,500 Hegner MK4 Accura multimachine.

Second prize. Robert Trace, Toledo, Ohio; Noah's ark on wheels; $1,000 in Bosch tools.

Third prize. Dee Cook, Lawrenceville, Ill.; scale rolltop desk with swivel chair; $500 in Porter-Cable tools.

Junior Craftsman (all designs)

Grand prize. Elton Eby, London, Ky.; working crane; $1,500 RBI Hawk scrollsaw.

First prize. Robert Reising, Des Moines, Ia.; Red Baron airplane; $1,000 in Skil tools.

Second prize. Winner wishes to remain anonymous; checker set; $750 in Dremel tools.

Third prize. Brad Marlatt, Newark, Ohio; horseshoe set; $250 in Meisel Hardware merchandise.

Citations (all designs, all divisions)

Best use of wood. Jack Rowland, Porterville, Calif.; cedar pickup with trailer and boat; $575 Milwaukee compound mitersaw.

Best model. J.C. Brown, Winter Garden, Fla.; tank; $250 in Formby's finishing supplies.

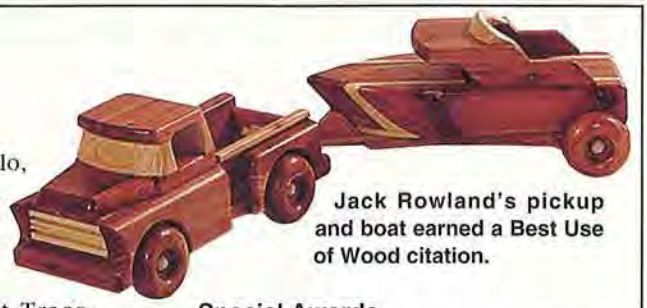
Best clear finish. Fred Krueter, Pepin, Wis.; walnut semi, lowboy trailer, and grader; $250 in Formby's finishing supplies.

Best painted/dyed finish. Robert Trace, Toledo, Ohio; Noah's ark on wheels; $200 in Red Devil paints.

Best educational toy. Nelson McAfee, Summerfield, Fla.; Humpty Dumpty puzzle; $250 in Crafts Supplies merchandise.

Best action toy. Robert Davenhall, Culpeper, Va.; roller coaster marble game; $250 in Woodworker's Store merchandise.

Best pull toy. Winner wishes to remain anonymous; spinning pegs on wheels; $250 in Klockit merchandise.



Jack Rowland's pickup and boat earned a Best Use of Wood citation.

Special Awards

Best toy from a woodworking club. No entries in this category; $250 in Leichtung merchandise, $200 in American Tool clamps, $200 in Red Devil paints, not awarded.

Best entry from a shop class. Mechanicsburg Intermediate School, Mechanicsburg, Pa., instructor William Richie; three five-piece train sets; $250 in Delta tools, $1,000 in 3M supplies, $300 in Red Devil paints, $200 in American Tool clamps.

Crafted for Joy© Toy Auction Top Money Raisers

Toy entries that brought at least $100 at the November 13, 1996, auction to benefit Toys for Tots were notified by letter. Here, though, are those readers whose handcrafted toys sold for $185 or more in the bidding that raised enough to purchase $20,000 in new toys for kids.

$625, scale radial-arm saw (bid included actual new saw donated by Delta).
Samuel Ericson
New Windsor, Ill.

Robert Reising's Red Baron airplane won First Prize in the Junior Craftsman category.

$580, bed bug pull toy
Mike Jagielo,
Almond, Wis.

$545, scale tablesaw (bid included actual new saw donated by Delta).
Brent Bobb,
Bountiful, Utah

$400, 1934 Chevy pickup.
Jack Dalton, Jackson, S.C.

$375, scale rolltop desk w/chair.
Dee Cook, Lawrenceville, Ill.

$240, golf clubs w/cart.
Kenneth Forseth, Shorewood, Ill.

$205, walnut pinball machine.
Charles Frodl, Belmont, Mich.

$190, Harley-Davidson-style trike.
W.L. Wardle, Las Vegas, Nev.

$185, roller coaster marble game.
Robert Davenhall, Culpeper, Va.

$185, music box structure.
William Howe, Ranchos Palos, Calif.

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602-502	Edge Beading	1/2"	1"	9/16"	$37.90
602-504	Edge Beading	1/2"	1-1/8"	3/4"	$39.90
855-503	Lock Miter *(for 5/8" to 1-1/8" thick stock)*	1/2"	2-3/4"	1-3/16"	$69.90
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806-690	SuperDuty Fl.Trim	1/2"	3/4"	2"	$39.90

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30T 1/8" or 3/32"	$135	$ 99	$ 89	$ 79
9"X40T	$146	$109	$ 98	$ 87
30T	$125	$ 99	$ 89	$ 79
*8-1/4"X40TX 3/32"	$136	$ 99	$ 89	$ 79
8"X40T 3/32"	$136	$ 99	$ 89	$ 79
30T	$115	$ 89	$ 80	$ 71
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DeWalt 8-1/2" & Ryobi 8-1/2"x60Tx5/8"	$179	$109
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DeWalt, Makita, B&D, Hitachi 12"x80Tx1"	$229	$139
Ryobi–Makita 14"x100Tx1"	$266	$179
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8"X60T	$150	$109
7-1/4"X60T	$150	$109

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220mm x 80T x 1/8" x 30mm	---	$159
9" x 80T x 1/8" & 3/32" K	$207	$179
10" x 80T x 1/8" & 3/32" K	$207	$159
12" x 80T x 1-1/8"K	$212	$181

SIZES AVAILABLE	LIST	SALE
300mm x 100T x 1/8" x 30mm	---	$189
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14" x 80T x 1"	$232	$197
14" x 80T x 1"	$266	$226
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Fine Woodworking Magazine test Oct. 96 page 43

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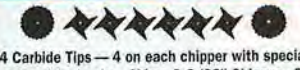

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Woodworking Vacations

Continued from page 73

Colorado's Anderson Ranch Art Center offers classes in a mountain setting.

sonable prices. At Colorado's Anderson Ranch Art Center, accommodations are in condos and townhouses, some with cooking facilities. Specialized workshops most often don't have on-site accommodations or meals, but may have special rates at local motels or suggest nearby camping. Whatever the options, if meals and lodging aren't included in the fee, they add to the cost.

• ***Bring your own hand tools.*** Workshops like you to bring your own hand tools, but you'll share the facility's power equipment. Sometimes, you can rent hand tools instead of bringing them along, but check on this.

• ***Who pays for the wood?*** A nominal lab fee usually covers wood to practice on, and may be included in the workshop fee. If you'll be building a major project—like a Windsor chair—you'll be expected to pay for the stock separately. You might be able to furnish your own wood. Ask.

• ***Pay on acceptance.*** All workshops limit attendance. Some may take 20 students; others, only five. This means you had better register early when you find the right workshop. And when you register, be prepared to pay a deposit equal to a portion of the workshop cost, and maybe even a processing fee.

With all to consider, it's important to ask yourself what you really want from a woodworking vacation. You have two options: Learn a technique to take home, or learn a technique and build a project to take home. At a woodturning workshop, you may be better off paying attention to the turning techniques. On the other hand, at an Appalachian greenwood chairmaking class, you're expected to complete the chair.

For a list of schools, send a self-addressed, business-sized envelope to: Vacation, *WOOD*® Magazine, 1912 Grand Ave., Des Moines, IA 50309-3379.

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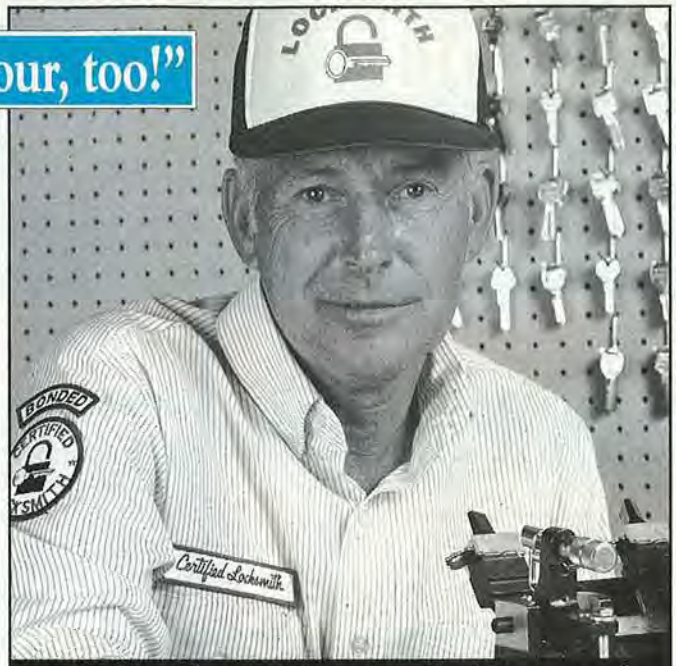

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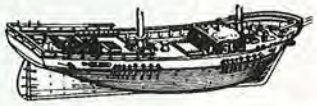

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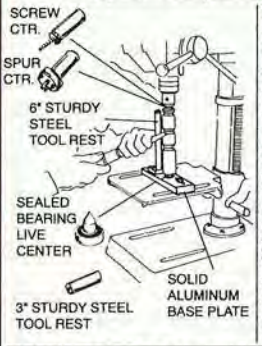

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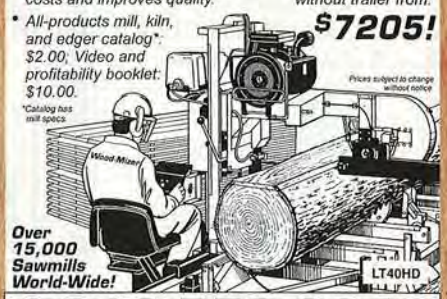

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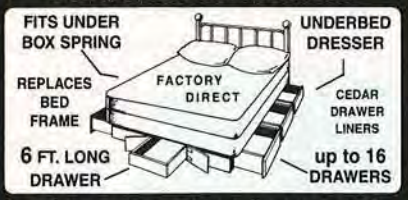

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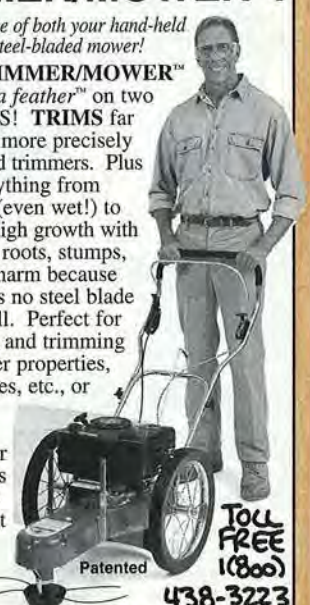

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Craftsman Tool Vac turns on/off with power tools

Have you ever wanted to hook up your shop vacuum to your power sander, but didn't because of the hassle of running to the vacuum to turn it on and off? Tool-activated auto-switch vacuums offer a solution and have been on the market for several years, but at a steep price. Fortunately, Sears recently introduced an affordable model that puts such convenience within most woodworkers' means.

The heart of the Tool Vac (model 17726) lies in its three-position rocker switch. Besides on and off positions, the switch has an auto setting that connects to an on-board power-tool outlet. In auto mode, you plug your handheld power tool (up to 6 amp) into the outlet, turn on the tool, and the vac comes on. Switch the tool off and the vac runs for an additional 5 seconds to clear the hose, then automatically shuts off.

The Tool Vac comes equipped with a pliable, 1¼"-diameter hose that's 11' long. The top-mounted handle provides convenient cord storage.

The auto-activated switch worked flawlessly, and the vac's 6-amp motor had plenty of power to suck up dust generated by my sanders. A foam seal makes the lightweight, three-gallon tank leakproof, and the two-stage filter captured all visible dust during my tests.

I only found two minor problems. Emptying the vac requires you to pull out on plastic handles on either side of the lid, but you almost need a third hand to fully separate the lid from the tank. A stepped hose adapter would make it easier to hook up to a variety of power tools.

—Tested by Bob McFarlin

PRODUCT SCORECARD

Sears Craftsman Tool Vac, model 17726

Performance	★ ★ ★ ★ ☆
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To set up your miter gauge, place two pennies in the miter-gauge slot to raise the bar slightly above the surface of the saw table. With the miter-gauge clamping knob loosened, place the MiterMatic over the bar and align one edge of a chosen groove against the bar. Keeping the groove's edge firmly against the bar, slide the square up against the miter-gauge face. The square moves the head to the proper angle. Then, tighten the clamping knob down and you're done.

I found all the angles extremely accurate. And since the angles are milled right into the polycarbonate, the square can't be knocked out of alignment.

The main drawback I found comes when using the square with tee-slot miter gauges, which can't easily be raised out of the miter slot. I also discovered that when setting bevel angles, I had to raise the blade completely to the top so the square cleared the blade's teeth.

—Tested by Dave Henderson

PRODUCT SCORECARD

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Continued on page 102

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Woodworker's Resource

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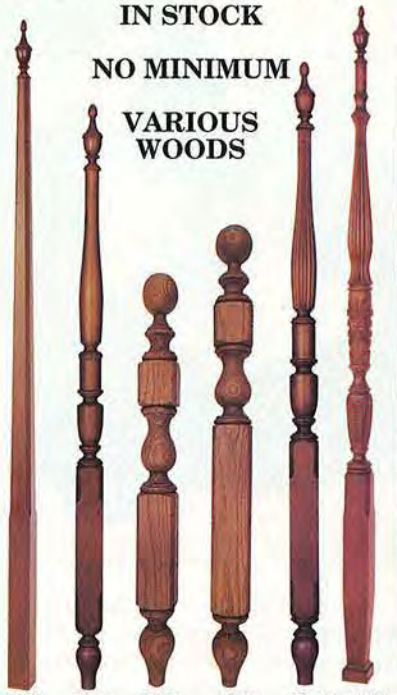

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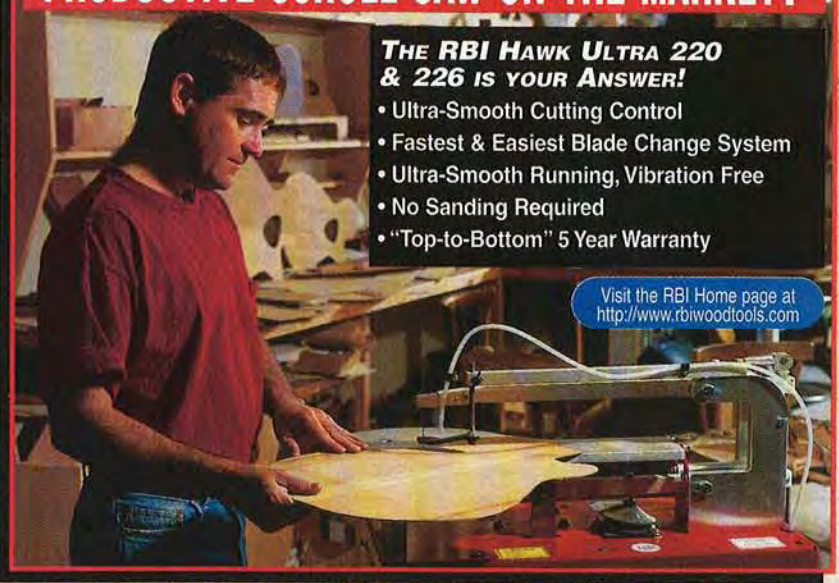

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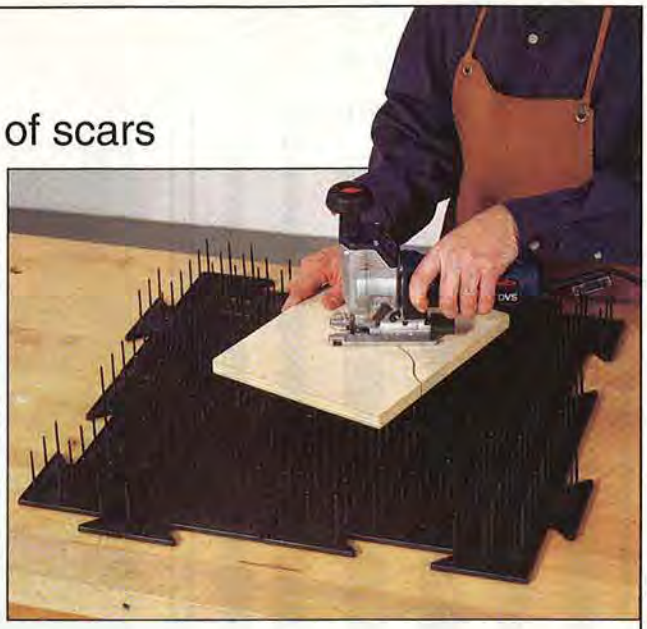
Continued from page 97

Porcupine Pad keeps benchtops free of scars

If your benchtop looks like mine, it bears the scars of times I've drilled too deep or sawn too close. Well, a new product called the Porcupine Pad should help keep future benchtop gouges and nicks to a minimum.

The pad consists of four interlocking 12×12" plates topped with 2½"-long plastic pins. The pins, spaced in rows 1¼" apart, support your workpiece above the benchtop without interfering with a drill bit or jigsaw blade.



PRODUCT SCORECARD

Porcupine Pad

Performance	★ ★ ★ ☆ ☆
Price	$39.95
Value	★ ★ ★ ★ ☆

Jim Dandy Products, 1695 Boundry Road, Downers Grove, IL 60516. Call 800/522-4717.

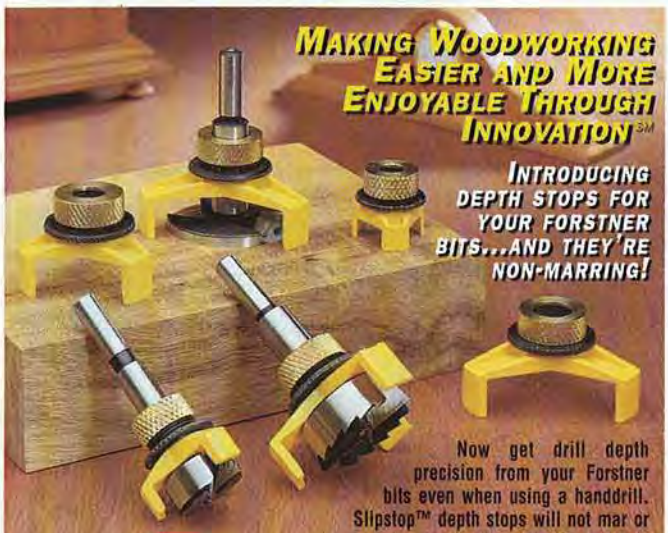
I tried several tools with the Porcupine Pad and found it worked best with a jigsaw, particularly when I held my workpiece firmly with one hand. When I tried edge-routing a board, the workpiece skittered across the pins, making it nearly impossible to complete the cut. I had mixed success using a circular saw, and even drilling caused the board to shift around slightly.

The pad's manufacturer recommends using the product with a mat or foam pad beneath it. I used a foam router mat, and it did help keep the Porcupine Pad from sliding on the benchtop.

If you do a lot of jigsawing, the Porcupine Pad may be worth trying out. However, I wouldn't recommend using it for two-handed operations such as routing. You also could use it as a drying rack for finished projects.

—Tested by Dave Henderson

Continued on page 104



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PRODUCTS THAT PERFORM — SHOP TESTED

Continued from page 102

Magnetic Dado Shims hold their position

If you own a stackable dado set, you know how necessary and frustrating shims can be. They're crucial for fine-tuning the width of a cut, yet they invariably wind up in the bottom of the saw cabinet or caught in the arbor threads.

SystiMatic offers a nifty solution—shims made out of magnetic vinyl. These shims measure 3¾" in diameter with a ¾" bore that keeps them clear of the arbor.

The set includes two each of .010, .012, and .015" with the thicknesses stamped on one side of the shim. SystiMatic magnetizes only this side, so you can stack the shims to the desired thickness. The vinyl flexes so you can easily "peel" them off.

I made a test cut for a ¾" dado that was .014" too narrow. I removed the outer blade, installed a .015" shim, made another pass, and found the cut width dead-on. While they don't allow the precision of plastic shims—available as thin as .002"—I still found that by varying the chippers and magnetic shims, I could obtain virtually any width. And to keep the unused shims handy, simply stick them to the side of your metal saw cabinet.

—Tested by Bob McFarlin

PRODUCT SCORECARD

Magnetic Dado Shims

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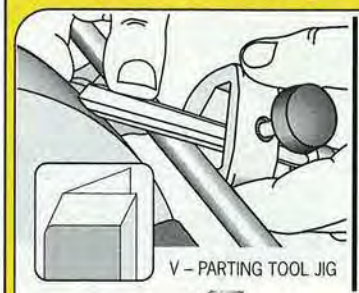

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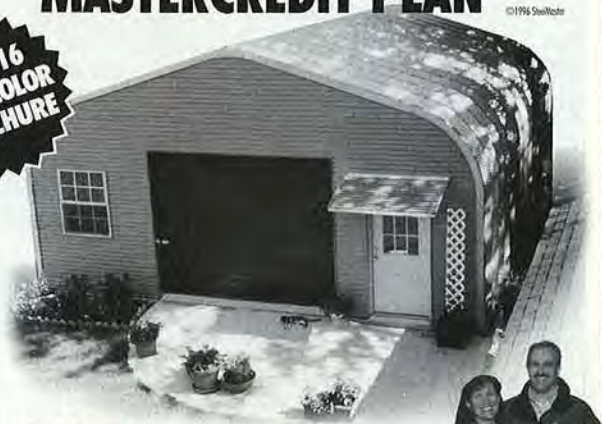

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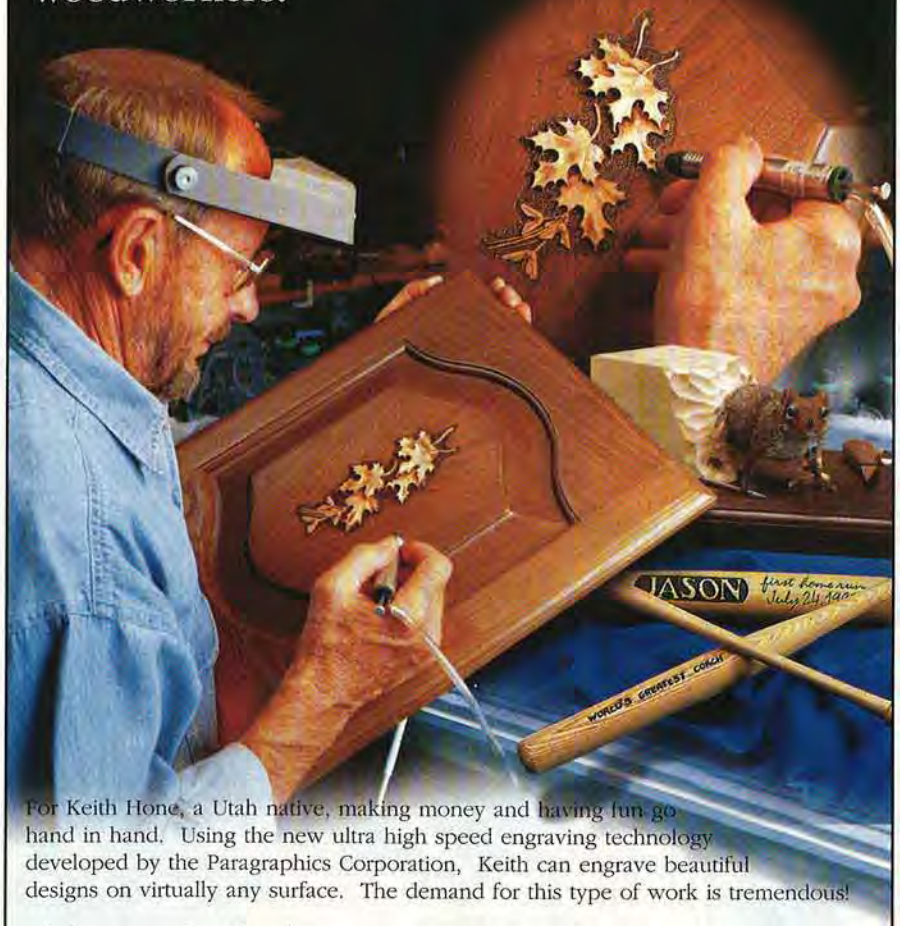

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Circle No. 2160

SANDING CENTER

Continued from page 55

Add the doors, shelves, and rigid casters

1 Cut a pair of plywood doors (R) to size. Rout a ⅜" rabbet along the back side of each where shown on the Exploded View drawing. *Do not* rout rabbets along the inside mating edges of the doors.
2 Drill mounting holes and add a pull to each door.
3 Mount a pair of ⅜" inset hinges to the back side of each door and then to the face frame.
4 If you don't house a vacuum inside the cabinet, consider adding a shelf for extra storage. To do this, cut the shelf (S) and banding strips (T) to size. Glue the banding to the front and back edge of the shelf.
5 Turn the assembly upside down, and position the rigid casters flush with the inside face of the back panel (D) and face frame rail (H). Drill pilot holes and screw the casters in place.

Clear-finish and paint the project

1 Remove all the hardware from the cabinet, doors, and drawers. Finish-sand as necessary. Apply a coat of clear finish to the drawers, doors, top, and shelf. (We applied three coats of satin polyurethane, lightly sanding between coats with 320-grit sandpaper.)
2 Paint the carcase interior and exterior. (We applied several coats of red spray enamel over primer for our cabinet, being careful to avoid runs.)
3 Screw the shelf standards in place. Attach the casters.
4 Screw the drawer slides to the supports (F) and then the mating parts to the drawer sides.
5 Working from the inside of the cabinet, drill mounting holes through the cleats and into the bottom side of the top. Screw the top to the cleats.
6 Use the hinges to secure the doors to the face frame. Reattach the pulls.

Written by Marlen Kemmet
Illustrations: Kim Downing; Lorna Johnson
Photographs: Studio Au

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DELTA TOOLS

Model	Description	List	Sale
31-280	Sanding Center w/ stand	1250	789
31-695	6" Belt/9" Disc Sander	441	349
23-700	Wet/Dry Grinder	206	158
23-710	New Sharpening Center	217	169
23-680	6" Bench Grinder 1/4 HP	80	69
31-460	4" Belt/Disc Sander	198	135
40-550	16" 2 speed Scroll Saw	230	169
40-540	NEW 16" var/spd Scroll Saw	249	189
11-990	12" Bench Drill Press	255	184
11-090	32" Radial Bench Drill Press	405	309
43-505	1/2" Bench Router/Shaper	398	299
22-540	12" Bench Top Planer	Sale	329
28-195	NEW 10" Band Saw	390	309

22-560 NEW 12-1/2" Bench top Planer **Sale 429.95**

36-865	NEW Versa Feeder Stock Feeder		249
36-220	10" Compound Mitre Saw	294	199
28-185	Bench Band Saw	213	168
37-070	NEW 6" v/spd Bench Jointer	351	265
14-650	Hollow Chisel Mortiser	380	239
33-990	10" Radial Arm Saw	981	799
33-055	8-1/4" Sawbuck comp w/legs	846	665
36-905	30" Unifence	346	245
36-906	50" Delta Unifence	444	325
17-900	16-1/2" Floor Drill Press	490	399
37-190	6" Deluxe Jointer	603	445
36-275	8-1/4" Builders Saw	358	268
36-285	8-1/4" Builders Saw w/ stand	Sale	285
36-210	10" Compound Mitre Saw	344	225
36-040	8-1/4" Compound Mitre Saw	190	144
36-070	10" Mitre Saw	217	165
34-555	Sliding Table	487	325
34-444	10" Contractors Table Saw	Sale	659
36-250	10" Slide Compound Saw	825	489
36-230	12" Compound Mitre Saw	480	345
31-780	Oscillating Spindle Sander	253	194
46-700	12" Wood Lathe	575	465
28-275	14" Band Saw 3/4 HP	Sale	635
28-280V	14" Band Saw 1 HP motor	Sale	798
34-445	10" Table Saw w/30" fence.	Sale	839
22-675	DC380 15" Planer	Sale	1175
43-355	3/4" Shaper 1-1/2 HP	Sale	799
37-154	6" Jointer DJ-15	Sale	1289
36-075	10" Compound Mitre Saw	256	189

MILWAUKEE TOOLS

6527	NEW Sawzall with case	343	169
6537-2	6527 w/quick lok blade change	224	175
0415-21	12V Drill w/kyls chuck&2 batt	380	172
0224-1	3/8" Drill 4.5 amp magnum	236	132
0234-1	1/2" Drill 4.5A mag 0-850 rpm	255	129
0235-1	1/2" Drill w/keyless chuck	255	135
0244-1	1/2" Drill 4.5A mag 0-600 rpm	255	129
0222-1	3/8" Drill 3.5 amp 0-1000 rpm	213	119
0228-1	3/8" Drill 3.5 amp 0-1000 rpm	207	118
0375-1	3/8" close quarter Drill	255	148
0379-1	1/2" close quarter Drill	288	165
6546-1	cdls Scrwdvr 200 & 400 rpm	150	89
6547-1	6546-1 w/bits,1/4" chuck & cs	185	108
5399	1/2" D-hdle Hammer Drill Kit	356	219
6507	Original SawZall with case	278	155
5397-1	3.8" v/ spd Hammer Drill Kit	275	145
5371-1	1/2" v/ spd Hammer Drill Kit	360	194
3107-1	1/2" v/spd right angle Drill Kit	411	234
3300-1	1/2" v/ spd right angle Drill	378	219
5682	Router 2 HP w/ collets	367	165
6142	4-1/2" Grinder w/cse & acc.	224	125
6365	7-1/4" Circular Saw 13 amp.	229	125
6368	6365 w/fence, bide,& cse	259	142
6256	Top Handle Jig Saw	278	159
6490	10" Mitre Saw	496	265
6491	6490 w/ carbide blade & bag	594	328
6494	10" Compound Mitre Saw	585	315
6256-6	Top Handle Jig Saw	315	169
6496	10" Slide Compound Saw	1050	569

FREUD CARBIDE TIPPED SAW BLADES
5/8" Bore - Industrial Grade

Item	Description	Teeth	List	Sale
LU72M010	Gen Pur. A.T.B.	10" 40	69	42
LU82M010	Cut-off 10"	60	93	44
LU84M011	Comb 10"	50	78	42
LU85M010	Super Cut-off	10" 80	115	59
LM72M010	Ripping 10"	24	69	38
LU73M010	Cut off 10"	80	84	45
LU87M010	Thin Kerf 10"	24	72	44
LU88M010	Thin Kerf 10"	60	88	49
LU98M010	Ultimate 10"	80	128	68
LU91M010	Compnd Mitre 10"	60	88	54
F410	Quiet Blade 10"	40	95	49
F810	Quiet Blade 10"	80	135	74
TK303	7-1/4" Finishing	40	38	25
TK906	10" Combo	50	53	32
SD308	8" Dado - Carbide		230	119
SD506	6" carbide w/case & shims		292	145
SD508	8" carbide w/case & shims		344	168
FB100	16 piece Forstner Bit Set		336	194
94-100	5 pc. Router Bit Door System		320	169
FT2000E	3-1/4 HP Plunge Router		410	205
JS102	Biscuit Jointer w/fence & cs		355	179

Freud Carbide Dado Blades

SD608	8" dial-a-width dado		389	199
SD606	6" dial-a-width dado		369	189
SD208	8" economy dado		155	85

WAP VACUUMS

Model	Description	List	Sale
766RDF	10 gallon turbo vacuum	845	465
766RDF-D	"Drywaller" 10 gal turbo vacuum	915	549
766RDF-DAS	Above vac w/ auto start	950	589

MAKITA TOOLS

5090DW	3-3/8" Saw Kit 9.6 volt	280	148
DA391D	3/8 angle Drill 9.6V	166	109
DA391DW	3/8" angle Drill Kit 9.6V	341	185
ML900	Incandescent Flashlight 9.6V.		19.95
6095DWE	9.6 volt Drill Kit w/2 batt	Sale	125
6095DWLE2	6095DWE w/flashlight	Sale	135
6095D	6095DW Drill only & cse	Special	65
632007-4	9.6 volt Battery	47	30
632002-4	7.2 volt Battery	39	28
6201DWHE	9.6V 3/8" Drill Kit w/2 batt	351	159
6211DWHE	12V 3/8" Drill Kit w/2 batt	368	175
6311DWHE	12V 1/2" Drill Kit w/2 batt	399	205

NEW CORDLESS DRILLS WITH 2.0 AMP HIGH CAPACITY BATTERIES

6213DWAE	12V 3/8" Drill Kit	325	179
6233DWAE	14.4V 3/8" Drill Kit	358	199

SUPER CORDLESS SPECIALS

6073DW 7.2V cdls Drill Kit. Variable speed & clutch. Complete with battery, charger, & case. ..... **Super Sale** 99

9900B	3"x21" Belt Sander w/bag	347	179
9924DB	3"x24" Belt Sander w/bag	360	189
4301BV	Orb. var. spd Jig Saw 3.5A	292	155
JR3000V	v/ spd Recip Saw w/case	264	135
9820-2	Blade Sharpener	433	215
N1900B	3-1/4" Planer with case	263	139
1912B	4-3/8" Planer	352	199
N9514B	4" Disc Grinder 4.6 amp	118	65
DA3000R	3/8" Angle Drill	355	179
2708W	8-1/4" Table Saw	637	309
6405	3/8" Drill Rev. 0-2100 rpm.	115	65
6510LVR	3/8" Drill Rev. 0-1050 rpm.	188	98
6013BR	1/2" Drill Rev. 6 amp	270	149
9401	4" x 24" Belt Sander w/bag	458	219
5007NBK	7-1/4" Circ Saw w/ case	250	125
LS1011	10" Slide Compound Saw	895	429
LS1211	12" Slide Compound Saw	1620	779
3901	Plate Joiner Kit	376	199
3612C	NEW 3 HP Plunge Router	492	279
LS1040	NEW 10" Cmpnd Miter Saw	460	259
LS1013	NEW 10" Dual Compound Slide Miter Saw	1088	599
BO5010	NEW 5" Random Orbit Sander with dust pickup	142	72

SENCO AIR NAILERS

SFN1+	Finishing Nailer 1" - 2" w/ cs	448	345
SN325	Nailer 1-7/8" - 3-1/4"	665	419
SLP20	Pinner w/cs 5/8 -1-5/8"	422	279
SKS	Stapler 5/8" - 1-1/2"	390	279
SN70	Framing -Clip Hd 2"-3-1/2"	725	449
SN60	Framing -Full Hd 2"-3-1/2"	708	459
SN65	15% more power than SN60	709	465
SFN40	Finish Nailer 1-1/4 - 2-1/2	599	389

BOSTITCH AIR NAILERS

N80S-1	Stick Nailer	Super Sale	339
N80C-1	Coil Nailer	Sale	339
RN45	Coil Roof Nailer 3/4 - 1-3/4	845	369
N60FN-2K	Finishing Nailer w/ case	557	295
BT35-2K	Brad Tacker 5/8" - 1-3/8" with case, oil, & brads	279	125
CWC100	1 HP Pancake Compressor	440	289
MIIIFS	Flooring Stapler 15 gauge	902	529
S32SX-1K	Finish Stapler-1/2" - 1-3/8" with case & oil	269	145

SKIL TOOLS

77	7-1/4" Worm Drive Saw	Sale	158
77M	77 Mag Worm Saw	Sale	168

PANASONIC CORDLESS

EY6181CRKW	9.6V Drill Kit w/ 2 batteries, 1 hour charger, & case	307	169
EY6100EQKW	12V Drill kit w/ 2 Ironman batteries, 15 min. charger, & case	379	179
EY6100SEQK	Same as above but has 1 Ironman battery and 1 diagnostic battery	Sale	204
EY6101SQK	12 volt 1/2" Drill w/ 15 min. charger, diagnostic battery, & case	438	249
EY6101EQKW	Same as above but has two Ironman batteries	Sale	249
EY3502EQKW	NEW 4-3/8" 12V Metal Cutting Saw Kit	500	289

PASLODE IMPULSE GUNS

IM250	Trimpulse Finish Nailer Kit	1130	548
IM325	Impulse Framing Nailer Kit	1130	548
CT325SS	Cdls Framing Nailer Kit	1120	495

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140	Portable sndr w/ 4-1/2" spindle	625	559
146	Portable sander w/ 9" spindle	685	609
100	Floor mount sndr 4-1/2" spindle	785	709
106	Floor mount sander 9" spindle	845	759

SIOUX TOOLS

8030	3/8" var/spd Drill	263	149
8000	3/8" var/spd close qtr Drill	211	125
690	5" Air Random Orbit Sander	228	132

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DW708
12" Dual Compound Slide Mitre Saw
Sale 679

DW788
20" Scroll Saw
Sale 489

DW733
12" Planer
Sale 459

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DEWALT TOOLS

Model	Description	List	Sale
DW321K	Top Handle Jigsaw Kit	300	164
DW364	7-1/4" Circ. Saw w/brake	294	162
DW610	1-1/2 HP 2 handle Router	266	152
DW411	1/4 sheet Palm Sander	88	58
DW100	3/8" Drill, 4 amp,0-2500 rpm	118	68
DW682K	Biscuit Joiner with case	448	199
DW705	12" Compound Mitre Saw	734	359
DW705K	DW705 with 80 tooth blade	Sale	395
DW625	3 HP v/ spd PlungeRouter. **DW625 router comes with DW6913 edge guide !**	Sale	279
DW621	NEW 2 HP Plunge Router. **DW621 comes with Free DW6956 fine height adjuster**	400	218
DW675K	3-1/8" Planer with case	292	164
DW431	3 x 21 v/spd Belt Sander	338	188
DW421	5" Palm Ran. Orb Sander	144	74
DW444	6" Ran Orb Sander	266	145
DW443	DW444 w/hook & loop pad.	266	145
DW673K	NEW Laminate Trimmer Kit	364	188
DW274	Drywall Gun, 0-4000, 6.3 amp	160	95
DW268	Tek Gun, 0-2500, 6.5 amp.	288	159
DW935K	14.4V 5-3/8" Trim Saw Kit with 2 batteries	444	237

DEWALT CORDLESS DRILLS

DW952K-2	3/8" variable speed w/ two 9.6V XR batteries	284	129
DW962K-2	3/8" variable speed w/ two 9.6V XR batteries	330	179
DW972K-2	3/8" variable speed w/ two 12V XR batteries	362	182
DW904	12 volt flashlight	48	29.95
DW972K-2 drill & DW904 flashlight		Sale	199
DW991K-2	3/8"variable speed w/ two 14.4V XR batteries	415	209
DW994KQ	1/2" variable speed w/ one 14.4V XR batteries	458	239
DW996K-21	2" v/spdw/ two 14.4 XR batt **Above drill kits come w/ charger & steel case!**	259	
DW991KS-2	DW991K drill, DW935 trim saw, & case	Sale	349

DEWALT 18 VOLT CORDLESS TOOLS

DW938K	NEW Recipro Saw Kit	520	289
DW995K	1/2" Drill Kit	428	229
DW997K	1/2" Drill/Hammar Drill Kit	454	249
DW936K	Saw Kit	458	249
DW995KS-2	DW995K Drill, DW936 Saw and case	Sale	395

HITACHI TOOLS

C8FB2	8-1/2" Slide Compound Saw	1169	489
C10FC	10" Mitre Saw	533	199
C10FS	10" Slide Compound Saw	1627	739
C15FB	15" Mitre Saw	1346	659
NV45AB	Coil Roofing Nailer 7/8 - 1-3/4	935	399
C7SB	7-1/4" Circular Saw	Sale	105

BIESEMEYER FENCES

B-50	50" Commer. Saw	443	325
T-SQUARE 52	52" Homeshop	360	275
T-SQUARE 40	40" Homeshop	335	255
T-SQUARE 28	28" Homeshop	325	245

PONY CLAMP FIXTURES

Model	Description	List	Sale	Lots of 12
50	3/4" Black Pipe	15.45	8.10	92.50
52	1/2" Black Pipe	12.65	6.95	74.95

BOSCH

Model	Description	List	Sale
1587VS	Top Handle "CLIC" Jig Saw	292	139
1587VSC	1587VS saw with case	Sale	149
1584VS	Barrel "CLIC" Jig Saw	288	139
	Bosch Metal Case for above Jig Saws		24
	Bosch 30 blade assortment for Jig Saws **1584VS or 1587VS**		28.99
	with steel case and 30 Bosch blades	Sale	175
1274DVS	3"x21" v/spd Belt Sander	301	175
1276D	4"x24" Belt Sander	379	225
1275DVS	3"x24" v/s Belt Sndr	379	214
1276DVS	4"x24" v/s Belt Sndr	408	229
1347AK	4-1/2" Grinder w/cs & acc.	172	95
1194VSR	1/2" v/ spd Hammer Drill	272	155
1194VSRK	above Drill w/ case	303	169
1604A	1-3/4 HP 2 Handle Router	269	142
1604AK	same as above w/cse & acc	337	185
1613EVS	2HP v/s Plunge Router	369	199
1615EVS	3 HP v/s Plunge Router	536	289
1634VSK	Recip Saw 10.5 amp	335	159
3310K	12V T-handle Drill Kit	345	175
3610K	14.4V Drill Kit	354	195
3107DVS	5" Random Orbit Sander	165	98
3107DVSK	3107DVS with case	195	115
3725DVS	5" Random Orbit Sander	256	149
3727DVS	6" Random Orbit Sander	266	154
B3915	10" Slide Compund Saw	1050	589
B7000	Corner Detail Sander	126	68
B7001	B7000 w/ variable speed	Sale	89.95
11224VSR	7/8" SDS Rotary Drill	404	229

STABILA LEVELS

24740	24" Angle Setter Level	Sale	20.95
24640	24" Level w/ hand holes	62.20	43
24670	48" Level w/ hand holes	79.70	55
24680	72" Level w/ hand holes	145.45	99
27170	48" Level w/o hand holes	71	49
27000	78" Level w/o hand holes	146	105
80LMS	Laser Level System	532	365
21990	NEW 10" Torpedo Level	Sale	14.95

AIRY AIR NAILERS

Model	Description	List	Sale
0241SK	Brad Nailer 3/8"-1 9/16"	140	98
0250SK	Brad Nailer 3/4"-2"	296	164
0626SK	1/4" Crown Stapler 3/8"-1"	194	104
0645	1/4" Crown Stapler 3/4"-1-9/16"	310	175
	Above Nailers come w/case, fasteners, oil & wrenches		
0565T	Angle Finish Nailer 1"-2-1/2"	386	205

RECORD WOODWORKING VISES

Model	Jaw\Width	Opening	List	Sale
53E	10-1/2"\15"	Quick release	248	109
52D	7"\8"	Quick release with dog	169	79
52-1/2D	9"\13"	Quick release with dog	231	95

PORTA NAILER

401	Porta Nailer complete	295	209
501	Face Nailer complete	295	209

DAVID WHITE

LP6-20	Sight Level package - 20x	329	215
LP6-20XL	LP6-20 w/9056 tripod & 7620 rod	269	
LT8-300	Level Transit - 26x	739	489
LT8-300P	above Level w/ optical plum	869	565
LT6-900	Level Transit - 20x	419	269
ALT6-900	Auto Level - Transit -18x	666	429
ALTP6-900	above Level with tripod & rod	799	499
ALP6-18HD	above Level w/ tripod & rod	599	395
LL100	Finish Line Laser Level	199	135
ML200	NEW Visible Beam Laser	979	799
ML200I	ML200 w/o detector & rod bracket	749	625

RYOBI SPECIALS

RE600	3 HP Plunge Router	500	235
BE321	3"x21" v/ spd Belt Sander	310	139
BT3000	10" Table Saw w/ stand	1125	539
AP12	12" Bench Planer	884	389
OSS450	Oscillating Spindle Sander	340	159
HT20VSK	NEW Multi Tool	115	55
CD125K	12V cordless Drill w/ 2 batt	175	109
WDS1600	16"x32" Drum Sander	980	569
DBJ50	NEW Detail Biscuit Jointer	114	69

Msxe6362	FEIN Triangle Sander w/spd		199
Msx625	FEIN New Air Triangle Sander		195
LPN672	PONY Air Palm Nailer w/glove		89
RTM01	ROTOZIP Drywall cut out unit		68.95

QUAL-CRAFT PRODUCTS

2200	Pump Jack	79	58
2201	Pump Jack Brace	30	20
2203	Pump Jack guard rail holder	31	21
2204	Workbench & rail holder combo	53	39
2500	Adjustable Roofing Bracket	9.95	7.95
	Buy any 6 (can be assort.) deduct 10%		
2601	Wall Jack	167	108
	Lots of 4 deduct additional 10%		

PORTER CABLE

9444	New Profile Sander Kit	220	99
7499	Ultimate Cut-out tool	119	69
97499	7499 w/ case & bits	150	89
690	1-1/2 HP Router 8 amp	278	149
90690	690 Router w/ steel case	309	159
691	1-1/2 HP Router D-handle	303	164
693	1-1/2 HP Plunge Router Base	338	184
6931	Plunge Router Base	139	82
697	1-1/2 HP Router/Shaper	418	235
698	Heavy Duty Shaper Table	238	135
352VS	3x21v/s Belt Sander w/bag	321	165
360	3"x24" Belt Sander w/ bag	397	214
360VS	360 Sander w/ variable speed	429	229
362	4"x24" Belt Sander w/ bag	412	224
362VS	362 Sander w/ variable speed	446	239
97751	1/2" v/spd Hammer Drill w/cse	274	155
9125	3-1/4" Planer Kit w/ case	250	145
9118	Porta Plane Kit 7 amp	400	235
505	1/2 sheet Pad Sander	249	139
97549	Top handle Jig Saw 4.8 amp w/ case & blades	275	144
330	Speed Block Sander 1/4 sheet	120	65
556	Biscuit joiner w/5556 fence	Sale	139
345	6" Saw Boss 9 amp	207	118
9345	345 comp. w/cse & carb blde	237	138
9647	TIGER CUB Recip. Saw	230	134
9637	Full var/spd Recip Saw 8 amp	276	148
7519	3-1/4 HP Router 2 Handle	469	255
7518	3-1/4 HP 5 speed Router	534	284
7539	3-1/4HP v/spd Plunge Router	534	279
7310	5.6 amp Laminate Trimmer	176	102
97310	Laminate Trimmer Kit comp	336	189
7335	5" Random Orbit Sander	254	135
97355	7335 w/ case & dust pick-up	274	145
7336	6" Random Orbit Sander	259	138
97366	7336 w/ case & dust pick-up	284	149
73333	Dust Collection system		24.50
332	Palm Grip Rndm Orb Sander	133	59
333	above sander with dust bag	148	65
334	333 Sander with PSA pad	148	65
335	NEW Palmgrip Random Orbit Sander with dual flip pad	Sale	85
551	Pocket Cutter with case	352	195
310	Production Lam. Trimmer	270	154
347K	7-1/4" "Framers" Circ Saw with plastic case	250	129
743K	7-1/4" "Framers" Circ Saw with case - left hand version	250	129
447	347 Saw w/ brake & case	259	139
7800	Drywall Sander	589	349
9737	Tiger Recipro Saw	307	165
BN125	Brad Nailer -18 ga. 5/8"- 1-1/4"	144	89
BN200	Brad Nailer -18 ga. 3/4"-2"	238	139
FN250A	Finish Nailer -16 ga. 1"-2-1/2"	362	189
DA250A	Nailer -15 ga. 1-1/4"-1-1/2"	412	235
FC350	Framing Nailer - clipped head	558	289
FR350	Framing Nailer - round head	558	289
9830	9.6V Drill Kit w/ 2 batteries	284	145
9862	12V Drill Kit w/ 2 batteries	382	179
9872	14.4V Drill Kit w/ 2 batteries	424	205

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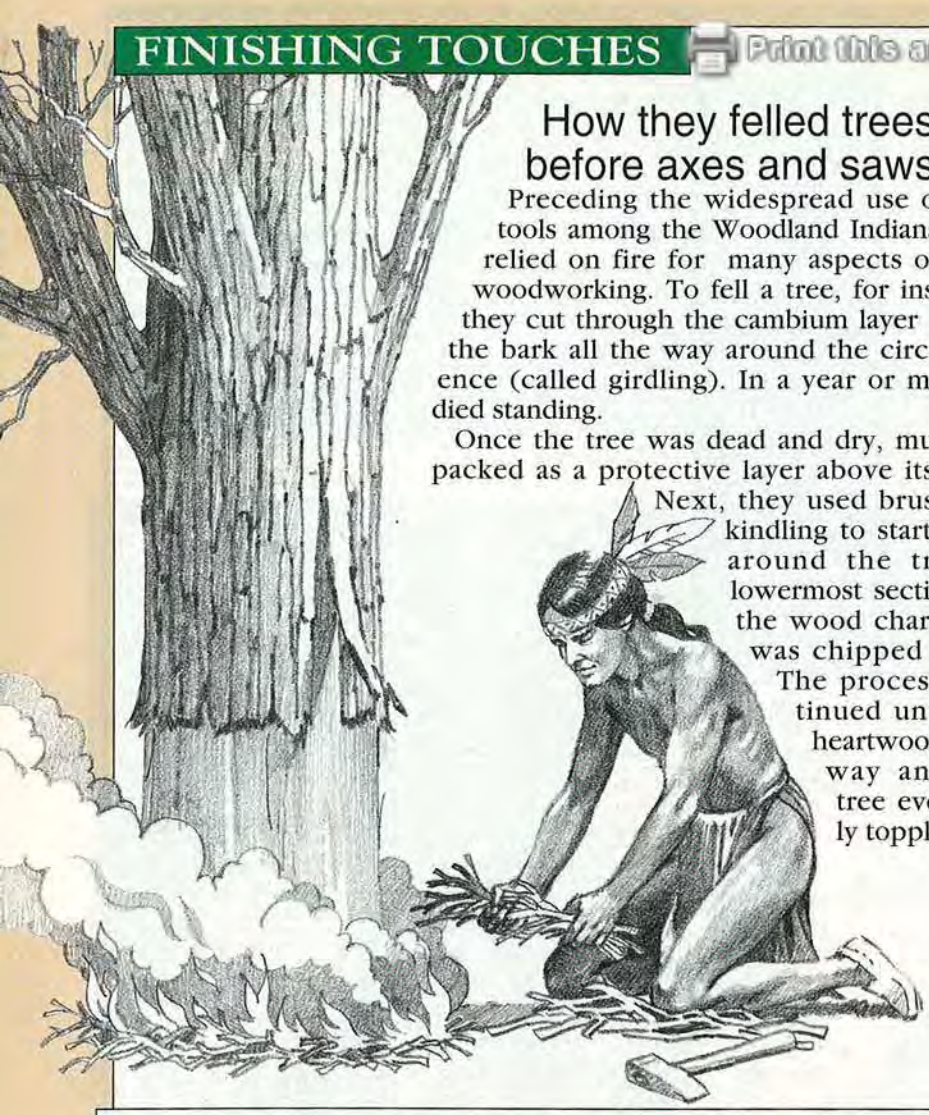
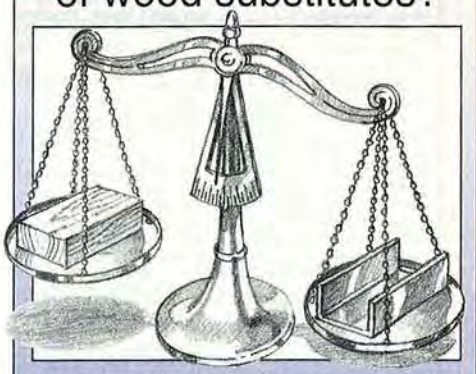
How they felled trees before axes and saws

Preceding the widespread use of iron tools among the Woodland Indians, they relied on fire for many aspects of their woodworking. To fell a tree, for instance, they cut through the cambium layer under the bark all the way around the circumference (called girdling). In a year or more, it died standing.

Once the tree was dead and dry, mud was packed as a protective layer above its base. Next, they used brush and kindling to start a fire around the trunk's lowermost section. As the wood charred, it was chipped away. The process continued until the heartwood gave way and the tree eventually toppled.



What's the true cost of wood substitutes?



Nonwood products require far more energy to manufacture than wooden ones, claims the Western Wood Products Association. For instance, it takes nine times more energy to make a steel stud than a wooden one.

Treejackers—not what they might seem

Unlike carjacking—a felony—treejacking is actually a good thing. Loggers sometimes use small hydraulic jacks set into a notch cut in the trunk to direct a tree's fall. In the mountainous Pacific Northwest, the method helps prevent timber loss by forcing the trees to fall uphill instead of crashing down an incline.

U.S. woodworkers donate skills to help an African university grow

How does a budding Christian university on the plains of Kenya get help to grow? Put out a call to the U.S. for volunteers.

Keith Henderson, a *WOOD*® magazine reader from Richfield, Minnesota, was one craftsman who answered. Last spring, he joined an eight-person team of woodworkers from Minnesota-area churches that (at their own expense) spent 16 days at Daystar University's new Athi River campus teaching Kenyans how to build classroom and dormitory furniture for their new institution.

"Our job was to teach the staff members how to use power tools safely and efficiently so they could in turn teach others," says Keith. "I couldn't believe how really eager they were to learn, and the skills that they picked up in such a short time. The local wood made it interesting, too. Most of it was unfamiliar to us, but proved to be good furniture stock. And language wasn't a barrier. Woodworking truly is universal."

◄ In their woodshop, Kenyan staffers learned from Americans how to build institutional furniture for their school.

Photograph: Keith Henderson
Illustrations: Jim Stevenson

Howard Packer, Newtown, CT, General Contractor

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WOOD® PATTERNS®

Full-sized for your woodworking convenience

OCTOBER 1997 **ISSUE 99**

Dear Reader: As a service to you, we've included full-sized patterns on this insert for irregular-shaped and intricate project parts. You can machine all other project parts using the Bill of Materials and the drawings accompanying the project you're building.

- **Sports locker**
- **Tea cart**
- **Futon recliner and ottoman**

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TEA CART

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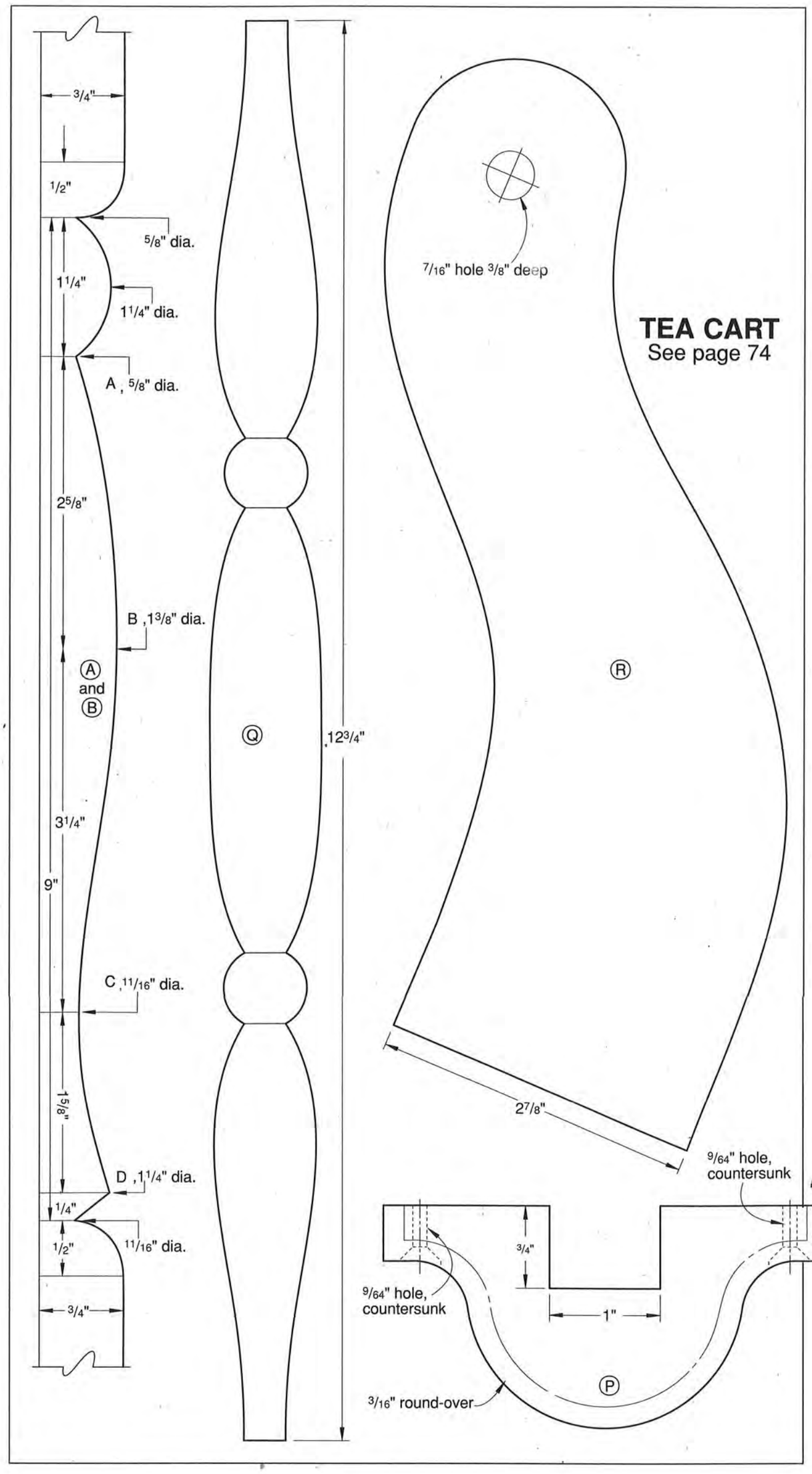
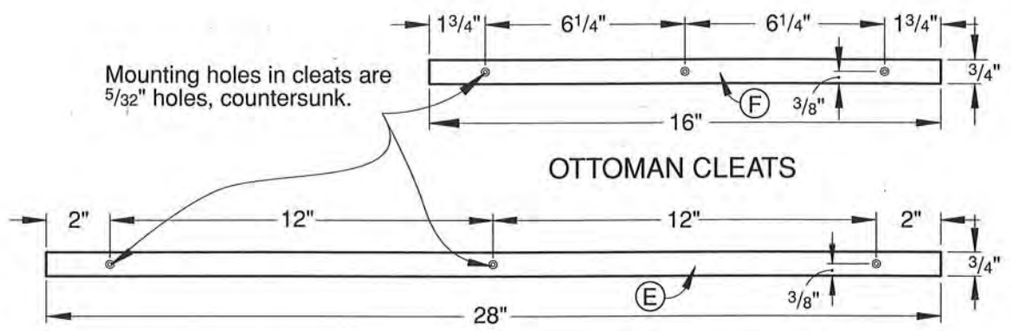


OTTOMAN PARTS VIEW



FUTON RECLINER AND OTTOMAN

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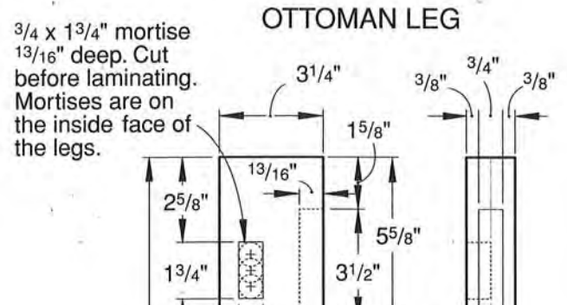
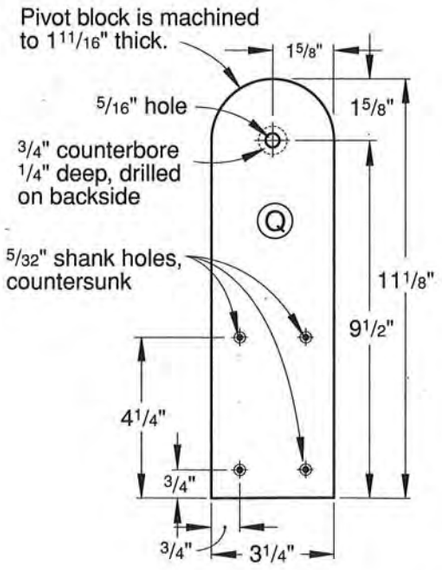
OTTOMAN LEG

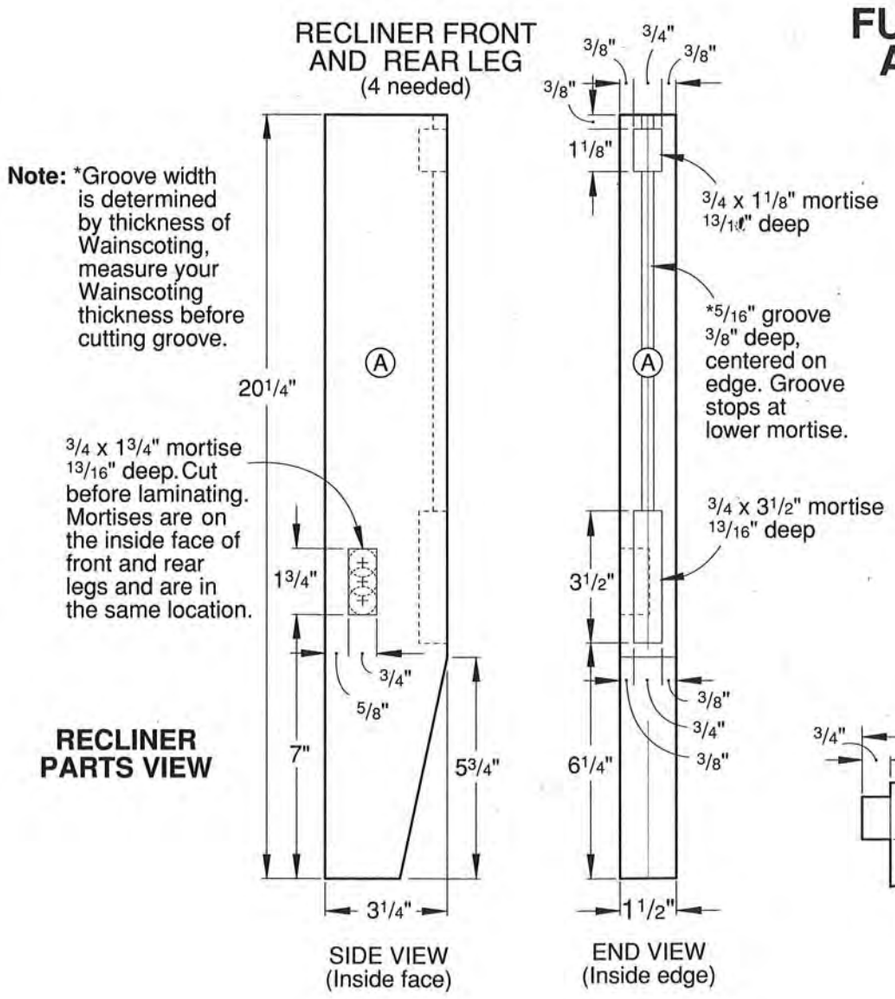


RECLINER PIVOT BLOCK (2 needed)



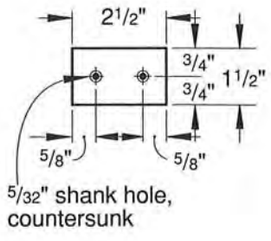
RECLINER FRONT AND REAR LEG (4 needed)

Note: *Groove width is determined by thickness of Wainscoting, measure your Wainscoting thickness before cutting groove.

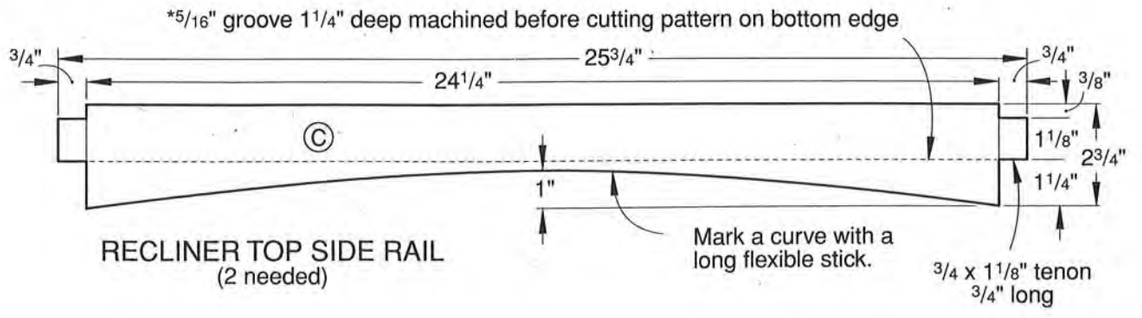


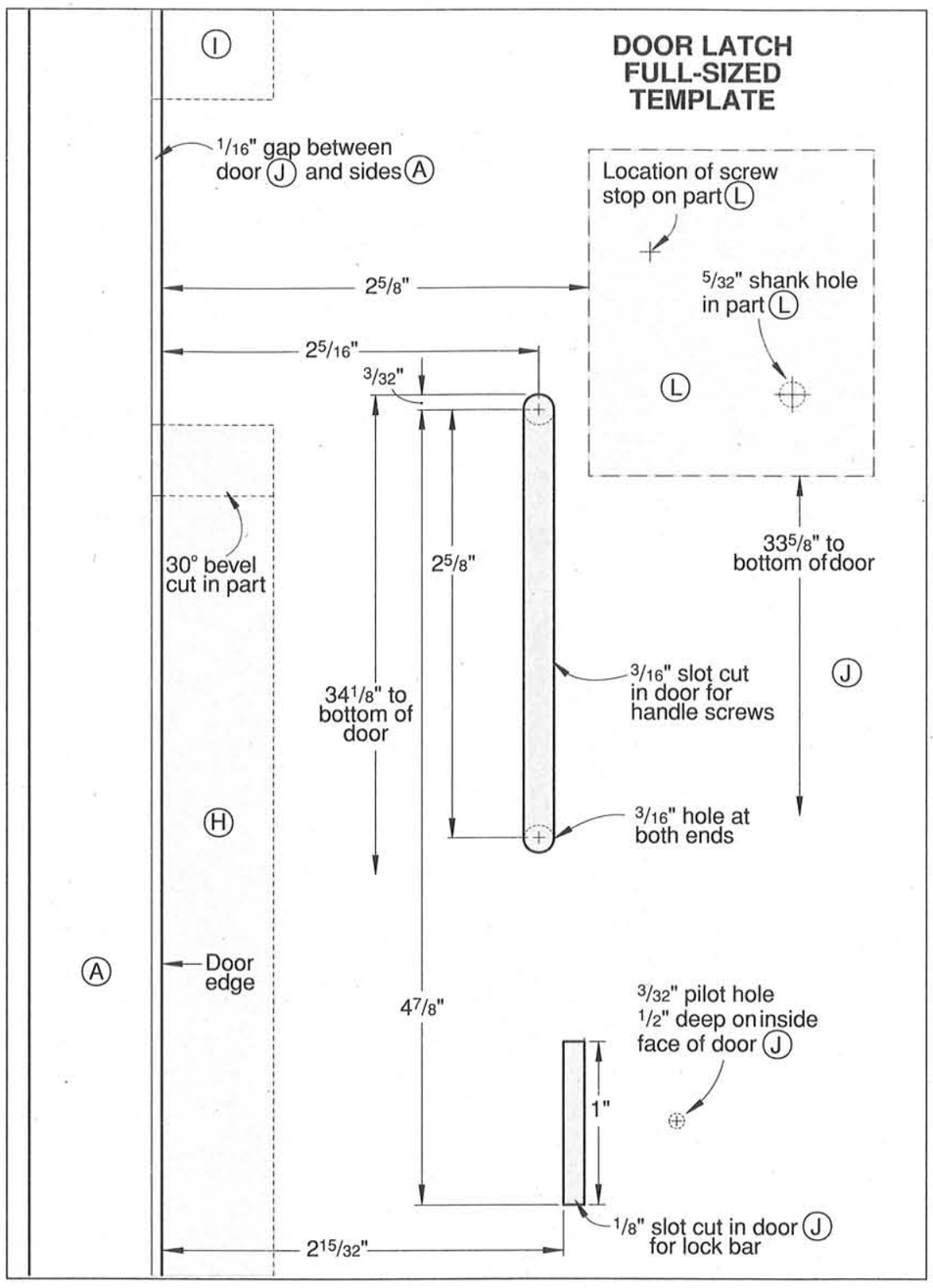
RECLINER PARTS VIEW

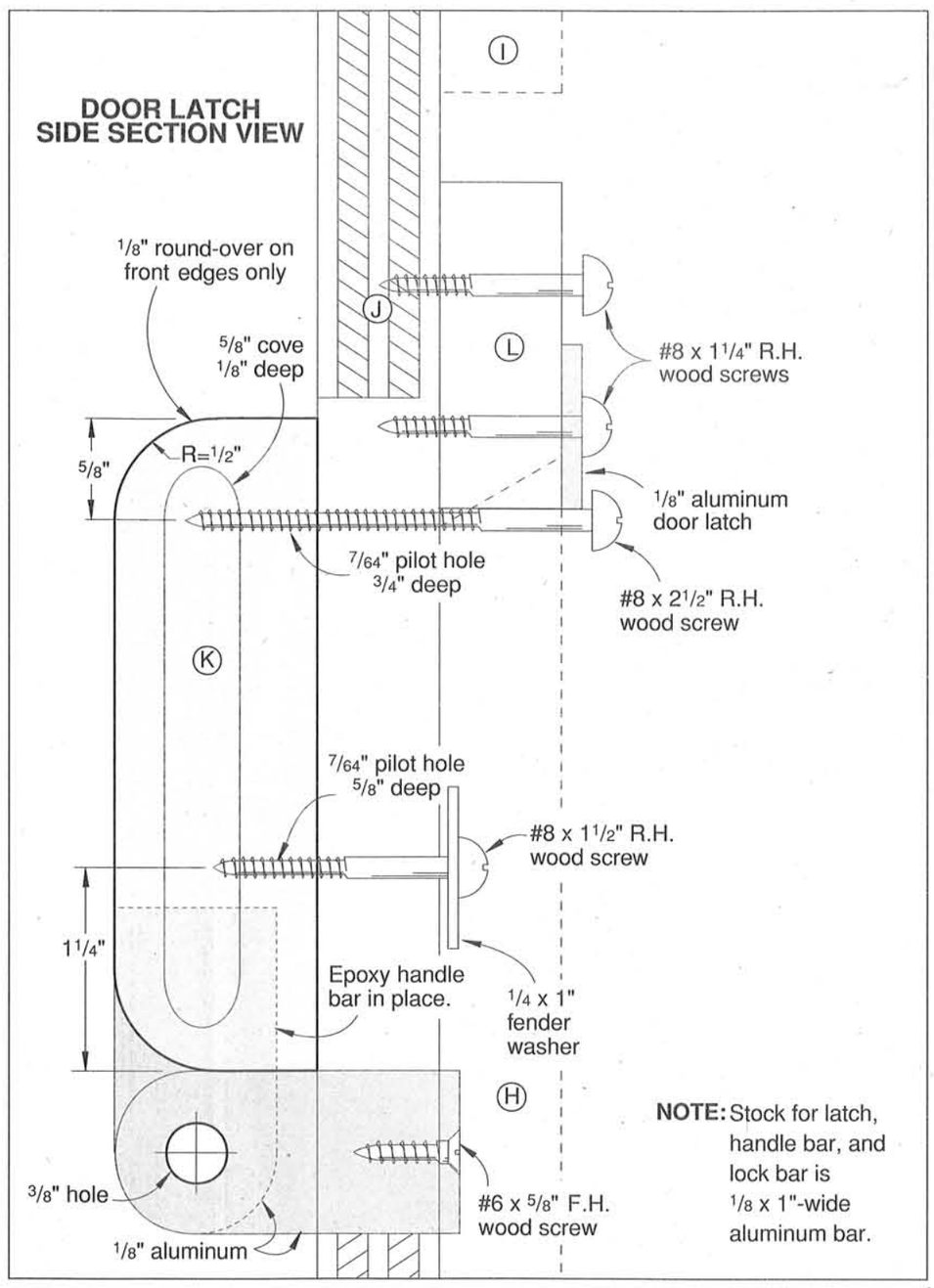
RECLINER STOPBLOCK (P) (TOP VIEW) (2 needed)

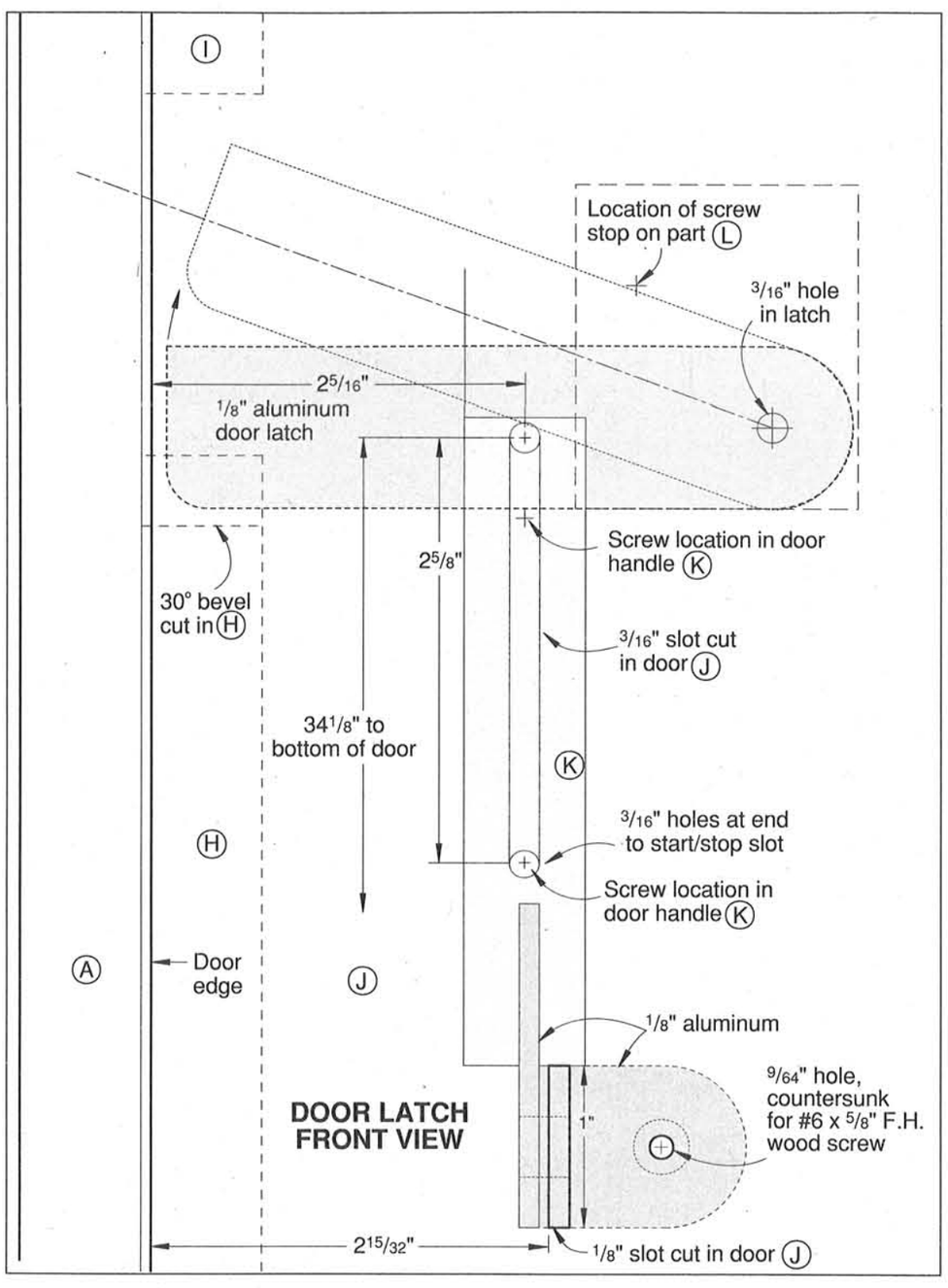


RECLINER TOP SIDE RAIL (2 needed)









SPORTS LOCKER

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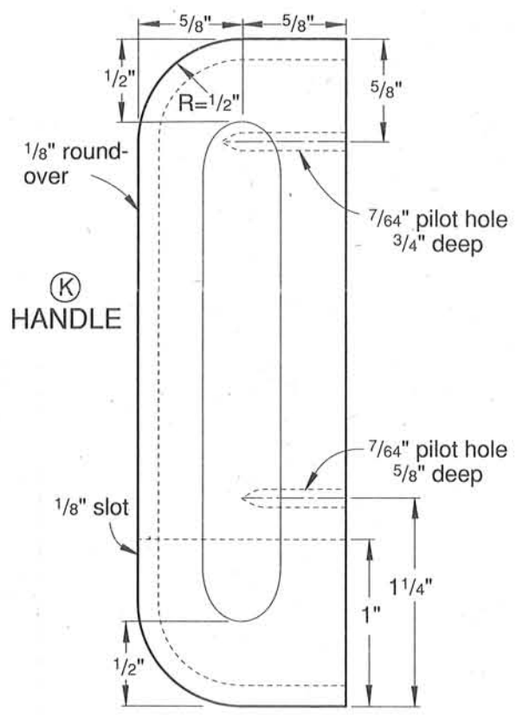

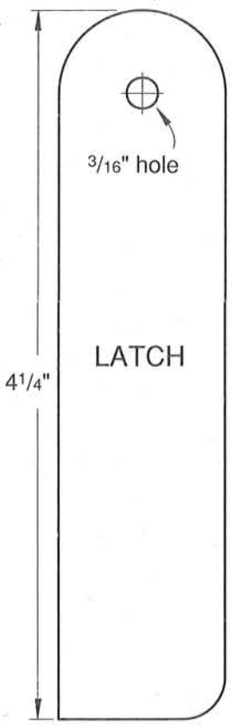

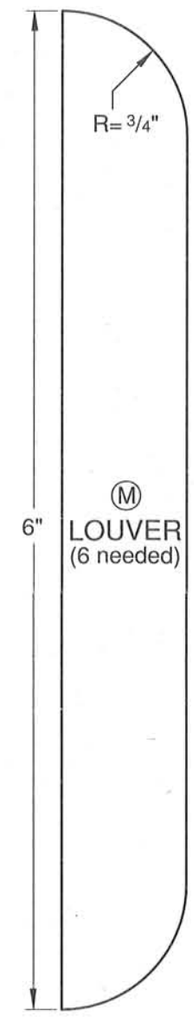
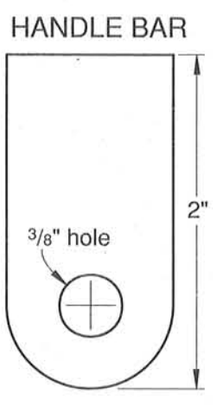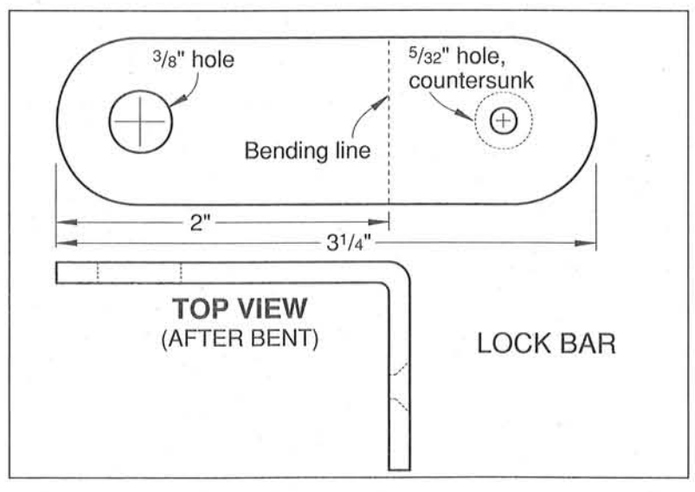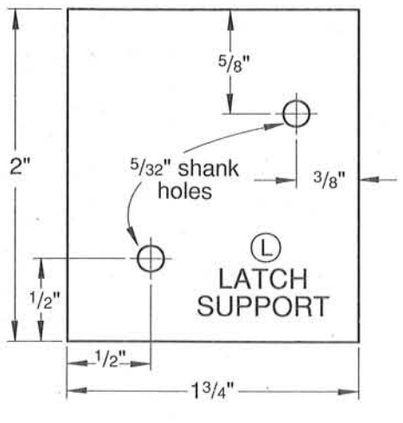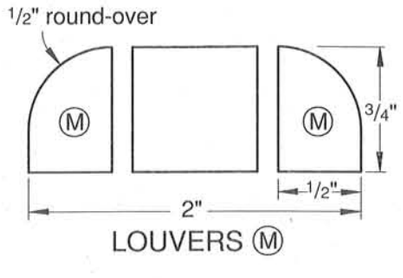
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